TECHNICAL MANUAL

RTE DELTEC

2727 Kurtz Street
San Diego, CA 92110
Telephone: (619) 291-4211
TWX: 910-335-1241

Technical Manual for DSU 20 Series Uninterruptible Supply

Customer:

When calling the factory for technical information or spare parts, please be prepared to provide model and serial numbers of your unit.

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TECHNICAL MANUAL FOR DSU 20 SERIES UNINTERRUPTIBLE SUPPLY	APPROVAL	PREP BY	
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WARNING

For safety reasons, use an Isolation Transformer (T1) when connecting the DSU to external batteries other than RTE DELTEC's RP battery packs. Refer to Section 1.3.1 for DSU models that include isolation transformers.

NOTE

The equipment supplied has had the RP 20s removed or disconnected from the unit as a safety precaution. The user should reconnect the RP 20 during installation.

RTE DELTEC advises the customer to always disconnect the battery when shipping the DSU.

IMPORTANT NOTICE

To provide customers with the most advanced electronic products, RTE DELTEC's product improvement program implements desirable design changes as quickly as development and test permit. Due to the time required to prepare and print handbooks such as this, it is not always possible to include optional or custom design features in the initial manual printing. When this occurs, supplementary text will be issued along with the manual.

Installation information contained in this handbook is a guideline presented for reference only. Local electrical codes and various restrictions at the customer's site may invalidate some recommendations contained herein. Where discrepancies exist, the user must follow all pertinent local codes.

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LIST OF ENGINEERING DRAWINGS AND BILLS OF MATERIAL (BOMs)

Title	Number
DSU 1000-1200 VA BOM	05132003
DSU 1500-1800 VA BOM	05132002
Driver Sensor Board BOM	05132025-5 & -6
AC Sensor and Relay Drive	05123595-2
Battery Charger Controller	05129826-232
DSU 1000-1800 VA Assembly	05131993
PLL Driver Sensor Board Assembly	05132026
AC Sensor and Relay Driver Assembly	05123596
Battery Charger Controller Assembly	05129827
DSU 1000-1800 VA Schematic	05132004
Driver Sensor Board Schematic	05132027
AC Sensor and Relay Driver Schematic	05123594
Battery Charger Controller Schematic	05129828

I. INTRODUCTION

This manual describes the RTE Deltec DSU Series 20 Uninterruptible System which is designed to provide regulated, transient-free AC power to sensitive loads. It is ideally suited for isolating critical, low-level analog instrumentation or digital circuitry from the effects of commercial power line outages, low line voltage, line fluctuations, or fast transients caused by switching or power line faults.

The basic system consists of a Rectifier-Battery Charger (B/C), a DC-to-AC Static Inverter, and a Mechanical Transfer Switch. When combined with either an internal or an external battery bank, the DSU system protects against power line outages or low line voltages for the duration of battery discharge time. The battery supply may be furnished by either RTE Deltec or the user, and should be specified to accommodate the anticipated maximum length of a power line outage.

The standard system incorporates the latest developments in solid state components, integrated circuits, and informative LED status indicators. These refinements reduce complexity, increase reliability, and make the system convenient to operate.

To minimize the need for personal attention, the DSU combines built-in sensors, accessory controls, and alarm circuits with front panel status indicators and remote contact closures. In this way the operator is automatically alerted to changes in the status of the Rectifier-Charger, Inverter, Transfer Switch, battery, or power line.

Because the DSU system includes an input circuit breaker, the need for external switchgear or special wiring is limited and installation is greatly simplified.

1.1 USAGE/SCOPE

This technical manual contains all of the information needed to operate and maintain the DSU 20 Series System. Individual model numbers and part numbers for specific units are located on labels affixed to the rear panel of the DSU. Please use these numbers in any correspondence with RTE Deltec.

The "List of Engineering Drawings and Bills of Material (BOMs)" located in the Contents section of this manual specifies the part number of the DSU and its assemblies/printed circuit assemblies. The top part number includes all other assemblies pertinent to the specific DSU. Because this manual covers a wide variety of RTE Deltec's DSU systems, some sections of this manual will not apply to all models.

The system theory of operation discussed in Section IV begins with an overall functional description based on a block diagram and interconnecting circuits. Subsequent descriptions provide details regarding each part of the system including the plug-in circuit boards within each assembly.

Other sections of this document describe installation, operation, and maintenance. The maintenance information includes procedures for preventive maintenance, sensor tests, and adjustments. The troubleshooting guide includes a compilation of the of the probable causes of a variety of system malfunctions. This publication also includes complete complements of mechanical and schematic drawings as well as a list of recommended spare parts.

Finally, the system warranty and procedurs for requesting in-warranty assistance are provided.

1.2 PURPOSE AND FUNCTION

The DSU system, when combined with a battery bank and connected to a regular AC power source, will provide the user with clean AC power. The input and output frequency and voltage ratings for the various models are provided in Table 1-2. The system will automatically revert to battery operation if the AC power is unusable. Thus, the DSU system ensures stable AC power to drive critical equipment, regardless of the condition of the commercial power source.

The system monitors its own output and battery supply as well as the Bypass AC power so that it can automatically determine when to make a transfer. In addition, the DSU provides status indications to the operator for all system elements and duplicates this information through contact closures for remote control or remote status indications.

To provide for battery back up when the commercial AC power fails, a complete range of battery reservoirs is available. RTE Deltec's RP 20 Reserve Battery Pack is an external battery reservoir that is compatible with the DSU. If an extended back-up time is required, the customer can use more than one RP 20 to meet those needs.

Table 1-1 indicates the number of cells, low voltage level, float voltage level, and equalize voltage level for sealed lead-acid, lead-antimony, lead-calcium, and nickel-cadmium batteries. When using batteries other than the sealed lead-acid (RP 20) type, it will be necessary to change the voltage levels by adjusting potentiometers on printed circuit assemblies (PCAs) in the DSU as follows:

- Low voltage: adjust R58 on the PLL Driver Sensor PCA
- Float voltage: adjust R35 on the B/C Controller PCA
- Equalize voltage: adjust R14 on the B/C Controller PCA

TABLE 1-1
Battery Parameters

BATTERY TYPE	NUMBER OF CELLS	LOW VOLTAGE Voltage	LOW VOLTAGE V/Cell	FLOAT VOLTAGE Voltage	FLOAT VOLTAGE V/Cell	EQUALIZE VOLTAGE Voltage	EQUALIZE VOLTAGE V/Cell
Sealed Lead-Acid (Gel-Cell)	36	59.5	1.65	82.8	2.3	N/A	N/A
Lead-Antimony Spec. Gravity 1.210	36	63.0	1.75	79.2	2.2	84.6	2.35
Lead-Calcium Spec. Gravity 1.210	36	63.0	1.75	79.2	2.2	84.6	2.35
Lead-Calcium Spec. Gravity 1.250	35	61.3	1.75	79.8	2.28	85.0	2.43
Lead-Calcium Spec. Gravity 1.300	34	59.5	1.75	80.0	2.35	85.0	2.5
Nickel-Cadmium (NiCad)	52	59.3	1.14	73.3	1.41	83.2	1.6

1.3 SYSTEM CONFIGURATION AND SPECIFICATIONS

The DSU is available in a basic unit consisting of the Battery Charger, the DC-to-AC Inverter, and the Mechanical Transfer Switch. Standard options include an input isolation/stepdown transformer (T1) and Radio Frequency Interference/Electromagnetic Interference (RFI/EMI) filtering. T1 is required whenever external batteries (other than RTE Deltec's RP 20) or a stepdown voltage are used.

The RFI/EMI filter is physically mounted inside the DSU to provide filtering on the input/output (I/O) so that the equipment performs optimally without affecting nearby sensitive electronic equipment.

1.3.1 Specifications

Table 1-2 below indicates the basic electrical specifications of the various DSU models.

TABLE 1-2
DSU Electrical Specifications

SPECIFICATION DESCRIPTION	DSU MODEL NUMBER 1022	1024	1220	1221	1522	1524	1820	1821
AC Input Voltage (VAC) at TB1	220	240	120	120	220	240	120	120
AC Input Current (Amps) Max at TB1	11.2	10.3	19.0	21.4	16.9	15.5	32.7	37.2
AC Output Voltage (VAC) at TB4	220	240	120	120	220	240	120	120
AC Output Current (Amps) Max at TB4	4.5	4.2	10	10	6.8	6.3	15	15
Output and Bypass Frequency (Hz)	50	50	60	60	50	50	60	60
Output Power Rating (VA)	1000	1000	1200	1200	1500	1500	1800	1800
Bypass Input (VAC) at TB2	220	240	120	120	220	240	120	120
Optional Isolation XFMR (T1)	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Heat Loss at Full Load (BTU/Hour)	1463	1463	1755	1755	2194	2194	2633	2633

1.3.2 Weights and Dimensions

Table 1-3, which follows, indicates the basic physical specifications of the various DSU models.

TABLE 1-3
Physical Specifications

	DSU MODEL NUMBER							
	1022	**1024**	**1220**	**1221**	**1522**	**1524**	**1820**	**1821**
Weight								
Pounds	190	190	150	190	237	237	183	237
Kg	86	86	68	86	107.5	107.5	83	107.5
Height								
Inches	14	14	14	14	14	14	14	14
mm	356	356	356	356	356	356	356	356
Width								
Inches	19	19	19	19	19	19	19	19
mm	483	483	483	483	483	483	483	483
Depth								
Inches	21	21	21	21	21	21	21	21
mm	533	533	533	533	533	533	533	533

1.3.3 Output Characteristics

Waveform	Sinusoidal; 5% Total Harmonic Distortion (THD) maximum at nominal line, full load
Power Factor	.8 Leading to Unity

1.3.4 System Reliability

Mean Time Between Failures (MTBF)	Greater than 30,000 Hours

1.3.5 Temperature

Operating	32°F to 104°F (0°C to 40°C)
Storage	-22°F to 158°F (-30°C to 70°C)

Temperature specifications do not apply to batteries.

1.3.6 Relative Humidity

90% maximum at 77°F (20°C) without condensation

1.3.7 Input/Output Connections

Terminal Blocks

1.3.8 Front Panel Controls

AC Power	ON/OFF Circuit Breaker
DC (Battery) Power	ON/OFF Circuit Breaker
Transfer Switch	

1.3.9 Front Panel Indicators

Meters	AC Output Voltage (M4)
	AC Output Current (M3)
LED Status Indicators	
AC INPUT	Green -- Normal Input
BATTERY CHARGE	Amber -- Recharge of Batteries
BATTERY LOW	Red -- Battery is 3 Volts above Inverter Shutdown
BYPASS OUTPUT	Amber -- Output is on Bypass

1.3.10 Control Output

Inverter Square Wave A	200 V Peak-to-Peak
Inverter Square Wave B	200 V Peak-to-Peak
Battery J3	84 VDC

II. RECEIPT AND INSTALLATION

2.1 CHECKING FOR DAMAGE

Take the following steps as necessary:

- Inspect the shipping container before acceptance from the carrier. If container damage is evident, remove the container and visually inspect for damage to the DSU system. Note any damage to the equipment and container on the carrier's receipt and have it signed by his agent. File a claim for damage (with a copy to RTE Deltec) with the carrier within 15 days of receipt of the system.

- If damage is not apparent until after acceptance, file a claim for concealed damage (with a copy to RTE Deltec) within 15 days of receipt of the system.

- When a claim is filed with the carrier, retain all packaging materials for inspection.

- If the instrument was damaged in shipment, failure to file a claim against the carrier within the specified time (with a copy to RTE Deltec) may void the warranty if damage is reported to RTE Deltec at a later date.

2.2 UNPACKING A DSU SHIPPED IN A BOX

When packed for shipment, the DSU is placed in a padded corrugated box.

To unpack:

- Open the top of the box.

- Remove the padding on the top of the DSU.

- Carefully lift the DSU from the box.

- If possible, retain the packaging material and box in the event that it is necessary to reship the DSU.

2.3 UNPACKING A DSU SHIPPED ON A PALLET

The system is set onto a pallet and placed in a corrugated shipping box. Unpack as follows:

- Remove the outer banding and the box.
- Remove the padding on top of the DSU.
- Lift the DSU from the pallet.
- If possible, retain the packaging and shipping material in the event that it is necessary to reship the DSU.

2.4 PLACEMENT OF EQUIPMENT

The DSU is designed to fit in a 19-inch (48.3 cm) rack. Because of the unit weight, it should be supported underneath by mounting brackets, not by the front panel alone.

Provide an adequate amount of space for the cooling of each unit. A fan removes internal heat loss (see section 1.3.1).

2.5 INPUT AND OUTPUT CONNECTIONS (See section 1.3.1)

Before connecting the DSU, turn OFF all front panel circuit breakers.

2.5.1 AC Input TB1

Connect the input lines to terminals 1 and 2, with neutral connected to terminal 2.

2.5.2 Bypass AC Input TB2

Connect the AC power source to terminals 1 and 2, with neutral connected to terminal 2. **NOTE:** The system will operate if the Bypass Input is not connected, but the system will lose power if it transfers from inverter output to bypass for any reason.

2.5.3 Safety Ground

Connect a safety ground conductor from the building ground to the I/O Panel and the point marked "Chassis Ground".

2.5.4 RP 20 Connections J3

The RP 20 is the Reserve Battery Pack normally used with the 1000 through 1800 VA DSUs.

Where one Reserve Battery Pack (RP) is used, connect the battery cable between the RP and J3 of the DSU. The cable can only be installed one way due to keying.

Where two Reserve Battery Packs (RPs) are used, connect the battery cable between one RP and J3 of the DSU. Connect the two RPs together with the supplied interconnect cable.

Where external batteries (other than RPs) are used, connect the batteries to J3-1(+) and J3-2(-). An input isolation transformer is required when external batteries are used. Depending on the type of batteries used, a different Battery Charger PCA may be required to provide the correct amount of charging current.

When shipping the DSU, always disconnect the battery from the unit at J3.

2.5.5 AC Output TB4

Connect the output lines to terminals 1 and 3, with neutral connected to terminal 3.

2.5.6 Contact Closures TB11

TB11-

- 1/6 and 2 -- No Inverter Output
- 1/6 and 3 -- Low Battery
- 1/6 and 4 -- No AC Input
- 1/6 and 5 -- Overtemperature

The contact closures are rated at the following:

- Current -- 2 Amps resistive
- Voltage -- 115 VAC/28 VDC

III. TERMS AND DEFINITIONS

Certain abbreviated terms have been substituted for phrases describing input and output signals in the text of this manual and on drawings. The following list describes these abbreviations.

NOTE

A False condition (F) is when the logic level is at the low state.

A True condition (T) is when the logic level is at the high state.

ABBREVIATION	DEFINITION
AC COM	The AC common bus
BYPASS AC	Bypass AC signal referenced to AC common
BYPASS REF and BYPASS REF	AC Signal, bypass referenced to DC common
BATT ALA C BATT ALA NO	Relay contact closure for battery alarm
BAT CH AC LO C BAT CH AC LO NO	Contact closure for low AC input to the Battery Charger
BAT CH AC LO I_S	Current sink for BATTERY CHARGER LOW status indicator light
BAT CH I_S	Current sink for BATTERY CONDITION RECHARGE status indicator light
BAT LO C BAT LO NO	Relay contact closure for low battery
BAT LO I_S	Current sink for BATTERY CONDITION LOW status indicator light
BAT REF	A DC level derived at the Inverter input circuit breaker
BAT SH + BAT SH -	Input from battery current shunt

ABBREVIATION	DEFINITION
FALSE (F)	The low state
GND	DC return or common
INV INV	Inverter square wave
INV AC INV AC	Inverter AC signal referenced to AC common
INV DC	Inverter DC input
INV REF INV REF	AC reference signals from the Inverter output referenced to DC common
OT C OT NO	Relay contact closure for over temperature
($\overline{\text{SYNC}}$ and COIN) T	Logic signal, TRUE when bypass AC and Inverter AC are phase coincident but not phase-locked
SYNC T	Logic signal, TRUE when bypass AC and Inverter AC are phase-locked
TRUE (T)	The high state
1/4 SDT	Logic signal, TRUE during Inverter start-up
1/4 ST TRIG	1/4 start circuit trigger pulse
$\pm$12 VDC	DC supply

IV. THEORY OF OPERATION

The theory of operation for the DSU begins with a general description of the system based on the system schematic.

This is followed by a discussion of overall system operation. Subsequently, the building blocks (i.e., the Battery Charger, the Inverter, and the Transfer Switch) that make up the system are discussed; as are operational discriptions of the plug-in circuit boards. The information in this section should enable a technician to understand how each circuit operates and provide the knowledge he needs to localize malfunctions to make repairs.

4.1 GENERAL DESCRIPTION

Figure 4-1 illustrates the normal operating condition of the DSU Series Uninterruptible Power System. Utility power supplies the voltage regulator; this AC power is rectified to drive the Inverter and the current-limiting, voltage-regulating Battery Charger.

The reservoir power is an on-line, floated battery which automatically maintains the correct float charge at all times. The battery charge system ensures maximum battery life by controlling the charge current and maintaining a minimum ripple current in the battery.

The SCR Inverter converts the DC to a square wave. The use of SCRs simplifies the system by minimizing components and increasing efficiency and reliability.

The stable square wave drives a unique ferroresonant transformer that shapes the square wave into the desired low-distortion sine wave. This output technique provides the correct voltage ouput, voltage regulation, current limits, and short circuit protection.

Control and alarm circuits operate as peripheral devices to allow manual or automatic operation and control. Sufficient output is available on standard DSU Series systems to monitor critical functions and operational signals locally or at a remote site.

A reverse mechanical transfer switch is a standard accessory. It can operate manually or, in the event of a system failure, automatically. To increase "total" system Mean Time Between Failures (MTBF), the Transfer Switch automatically switches the critical load to the bypass power source if a DSU output failure occurs.

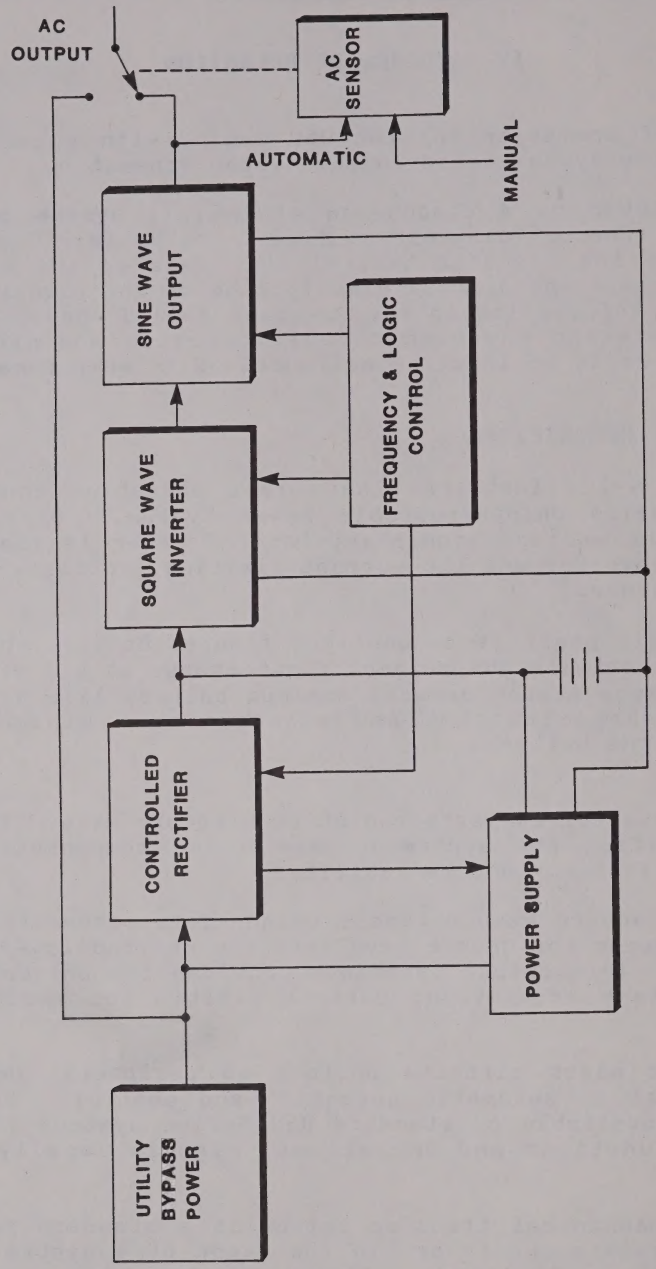


Figure 4-1. DSU System Block Diagram

4.2 SYSTEM OPERATION (See System Schematic)

The AC Input comes in to the system through CB1 and drives the full wave rectifier bridge consisting of CR1, CR2, Q1, and Q2.

T1 is an optional input transformer that is used as an isolation or stepdown transformer.

The bridge output voltage is duty-cycle controlled by the SCRs, Q1 and Q2, to provide DC voltage regulation on the output of the LC filter made up of L1 and C1. C21 provides added filtering once CB3 is in the ON position. The control for the SCRs is provided on A2.

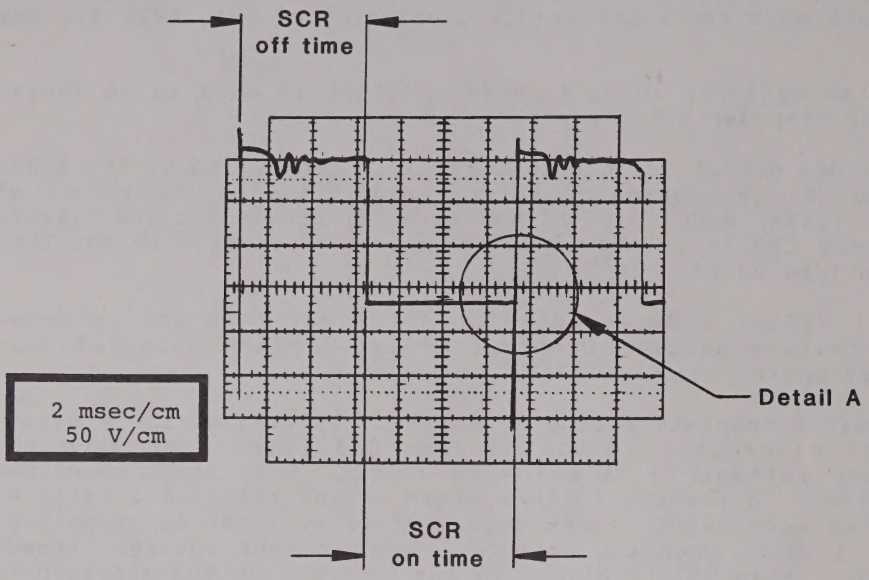
The LC filter reduces the ripple current into the battery. This feature assures longer battery life and more reliable battery operation.

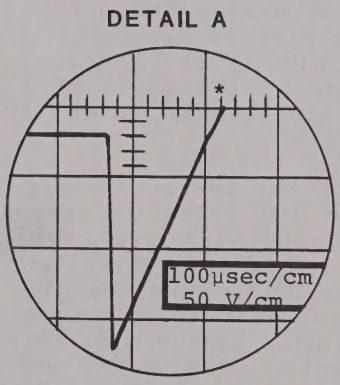
To prevent complete discharge of the batteries during a brownout or blackout, circuit breaker CB3 trips open when the battery voltage falls below 60 volts. This shuts down the Inverter. To prevent further drain on the batteries, relay K3 opens as soon as CB3 trips open. After AC input is reapplied, K3 will close when the Battery Charger output voltage exceeds 60 VDC. When CB3 is placed in the ON position and a return to normal system operation is desired, place S1 in the LINE position and then back to the INV position.

The main DC power bus drives the Inverter stage through CB2. Inverter Drive Board A1 drives the gates of Inverter SCRs Q3 and Q4. The Inverter circuit is a self-commutation circuit. When Q3 is conducting, Q4 is off and current flows from T2-3 through the transformer to the anode of Q3, and then through L3. At this time, C4 charges to about 150 volts through the autoformer action of T2-5.

When Q4 is turned on by the Inverter Driver Board, commutation inductor L2 forces the 150 volts on commutating capacitor C4 to be impressed across Q3 with positive on the cathode and negative on the anode. This reverse voltage across Q3 turns it off and allows Q4 to conduct, thus charging C4 to 150 volts in the opposite direction and providing energy to commutate Q4 off the next time Q3 turns on. Snubbers Z1 through Z4 protect SCRs Q1 and Q2 from transients. Diodes CR3 and CR4 provide a path for reactive currents to flow. Figure 4-2 shows a typical wave shape across an Inverter SCR.

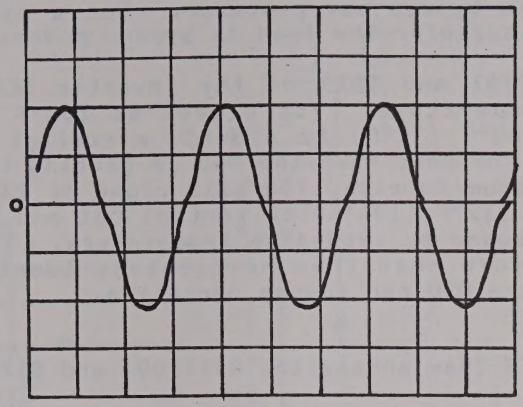
Output transformer T2 is a ferroresonant transformer that is driven by the square wave inverter to provide a regulated sine wave output. Figure 4-3 shows typical output wave shapes, loaded and unloaded, from a ferroresonant transformer.





* Commutation Time:
160 µsec - TYP

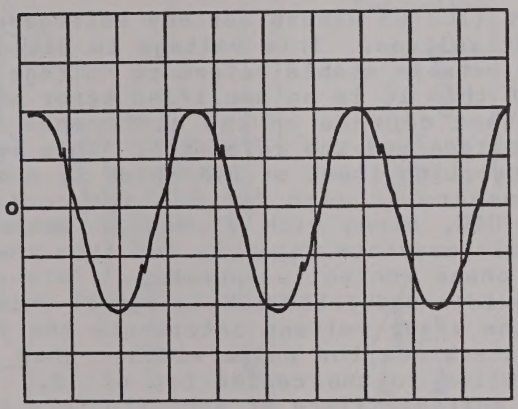
Figure 4-2. Waveform Across Inverter SCR



NOTE:

Distortion at zero crossing with no load

100 V/cm - 5 ms/cm



NOTE:

Distortion moves toward the crest as the unit is loaded 100%

100 V/cm - 5 ms/cm

Figure 4-3. Waveform from a Ferroresonant Transformer

Inverter output drives the output relays, K4 and K6, so that if the Inverter fails or is turned off, the load is automatically transferred to the bypass power source. For a system check, switching S1 will transfer the load to bypass power.

Thermal sensors (TS1 and TS2) on the Inverter SCR heatsinks monitor their temperature. TS1 closes at 180°F (82°C) and opens again at 160°F (71°C) to provide a contact closure at TB11 that alerts the user when the DSU is getting too hot. If temperatures continue to rise, TS2 will close at 239°F (115°C) and open again at 219°F (104°C) to control CB1 and protect the DSU from damage caused by excessive temperature. The cause of the high temperature must then be located, identified, and corrected before the DSU can resume operation.

4.3 BATTERY CHARGER (See schematics 05132004 and 05129828)

The main power devices for the AC-to-DC power supply are shown on drawing number 05120306. The full-wave rectified bridge made up of CR1, CR2, Q1, and Q2 is filtered by L1 and C1 to provide the main DC power bus at approximately 84 VDC.

The purpose of this circuit is to provide voltage control (regulation), current limiting, automatic timing for proper charging of the single-phase UPS battery banks, and to supply power to the UPS Inverter. The block diagram in Figure 4-4 outlines the operation of this circuit.

Integrated circuit (IC) U3 senses battery voltage and provides a regulated output voltage. This voltage is divided down and compared to an adjustable stable reference voltage provided by U3. The output of this IC is an amplified error voltage which has a magnitude that depends on the difference between the sampled battery voltage and the reference. This error voltage is fed into the inverting input of U4A which is one section of a quad voltage comparator used for voltage control. Zero-crossing detector U4B, along with Q9 and RC network R67-C24, generates a sawtooth waveform which is fed into the noninverting input of the phase control comparator. This comparator's output is a pulse-width-modulated 120 Hz signal which gates Q6. The point where the error voltage intersects the falling edge of the sawtooth determines the pulse width. When Q6 is gated on, voltage is applied to the center tap of T2. This causes Q4, Q5, and T2 to self-oscillate at approximately 16 KHz. The secondaries of T2 provide gate drive to the phase-control SCRs. The firing phase angle depends on when Q6 is gated on, which in turn depends on the negative-going edge of the pulse-width-modulated signal on the output of U4. Because this is a closed loop circuit, the control SCRs will always fire at an angle so that the integrated voltage appearing at the inverting input of U3 will equal the reference voltage at the noninverting input.

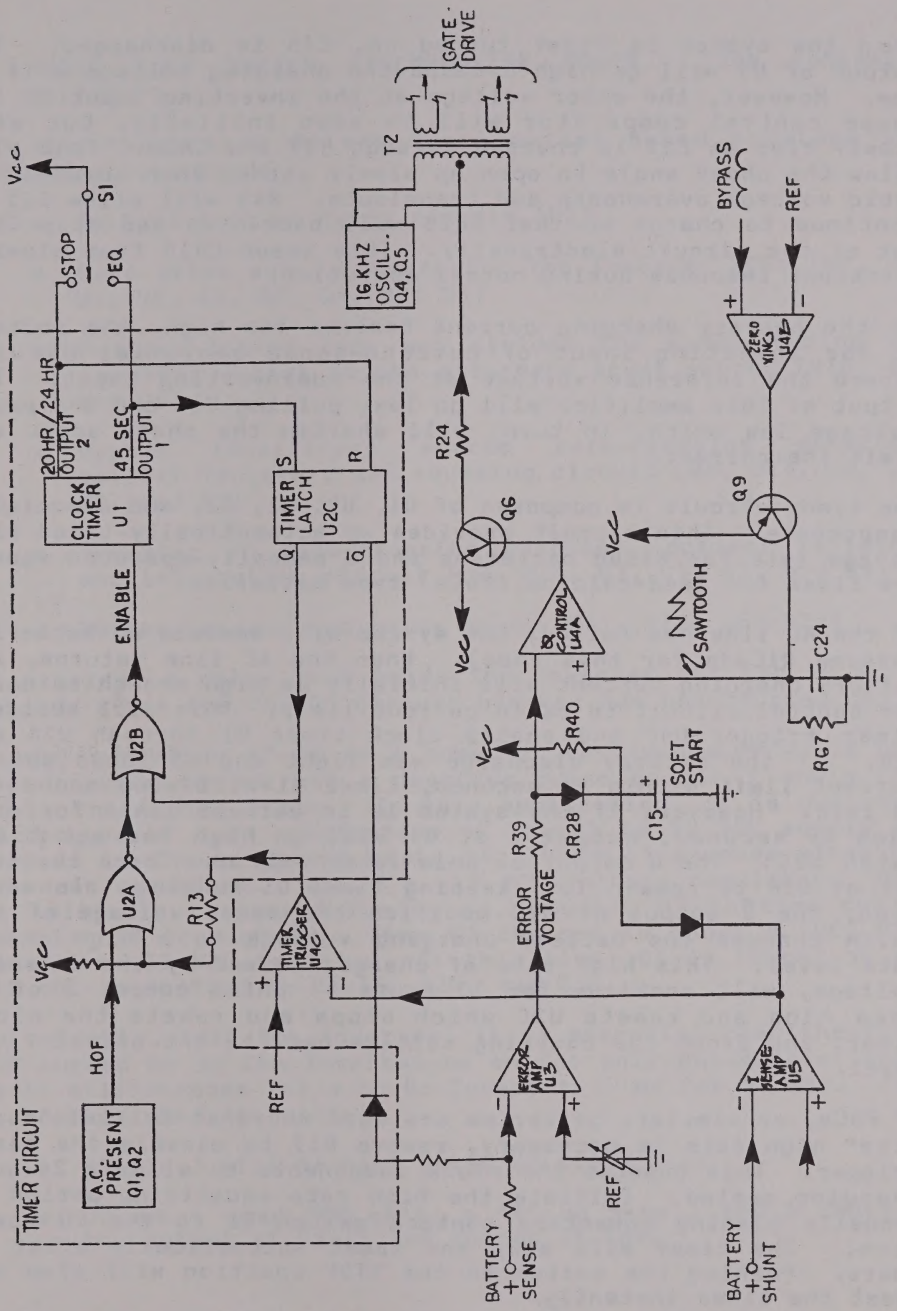


Figure 4-4. Block Diagram -- One-Phase Battery Charger Control Circuit

When the system is first turned on, C15 is discharged. The output of U3 will go high because the charging voltage will be low. However, the error voltage at the inverting input of the phase control comparator will be zero initially, but will slowly rise as C15 is charged through R39 and CR28. This will allow the phase angle to open up slowly rather than abruptly to avoid voltage overshoots and transients. R40 will allow C15 to continue to charge so that CR28 will back-bias and drop CR15 out of the circuit electrically. This keeps CR15 from slowing transient response during normal operation.

If the battery charging current becomes too high, the voltage at the inverting input of current-sense amplifier U5 will exceed the reference voltage at the noninverting input. The output of this amplifier will go low, pulling C15 and the error voltage low which, in turn, will shorten the phase angle and limit the current.

The timer circuit is composed of U1, U2, Q1, Q2, and associated components. This circuit provides an automatically-timed high charge rate for NiCad batteries and a manually-operated equalize timer for lead-calcium (PbCa) type batteries.

If the AC line has failed, the system will operate on batteries (assume NiCads for this case). When the AC line returns, the battery charging current will initially be high enough to cause the control circuit to be in current limit. This will activate timer trigger U4C and enable clock timer U1 through U2A and U2B. If the battery discharge was light and U5 comes out of current limit within 45 seconds, timer U1 will stop and reset to zero. However, if the system is in current limit for more than 45 seconds, output 1 of U1 will go high and set timer latch U2C. The Q output of this latch will now force the output of U2B to remain low, keeping timer U1 running. In addition, the $\overline{Q}$ output of U2C modifies the sense voltage of U3, which changes the battery charging voltage to a high charge rate level. This high rate of charge, caused by the elevated voltage, will continue for 13 hours -- until output 2 of U1 goes high and resets U2C which stops and resets the clock timer, and drops the charging voltage back to the normal float level.

If PbCa, or similar, batteries are used where an initial "equalize" high rate is necessary, remove R13 to disable the timer trigger. This changes the clock components to allow a 24-hour charging period. Initiate the high rate equalizing period by manually placing momentary contact switch S1 to the EQ position. The timer will stop and reset automatically after 24 hours. Pushing the switch to the STOP position will stop and reset the timer instantly.

4.4 PHASE LOCK DRIVER SYNCHRONIZER BOARD (See schematic 05132027)

The Phase Lock Driver Synchronizer Board provides the following functions:

- Initial turn-on delay circuit (U2)
- Gate drive and 1/4 start for the Inverter SCRs (U3, U4, U5, Q1, Q2, Q3, Q4, and Q5)
- A phase-locked loop and divider for synchronizing the Inverter output to the alternate power source (U10, Q7, and U4)
- Bypass (Auxiliary) source zero-crossing detector, optical isolator, and squaring circuit (Q6, U13, U6, U5, U8, and U9)
- Inverter AC zero-crossing detector, optical isolator, and integrating circuit (U8, U14, U7, U5, U3, and Q9)
- Battery sensor and relay drive (U11, Q12, and Q10)

U2 provides a delay that holds the Inverter off for 10 to 35 seconds after the DSU DC circuit breaker has been turned on.

Normal operation of U2 as a one-shot multivibrator would have R1 connected to Vcc and a negative pulse on pin 2 would initiate the timing cycle. In this application, it is desirable to trigger U2 upon application of the 15 to 20 VDC supply and hold it in the triggered state for 10 to 15 seconds after CB3 has been energized. U1 is a +12 VDC voltage regulator. U2-2 is initially triggered low by C1, causing U2 to time out by charging C3 through R2. When C3 charges to about 8 VDC, U2-3 goes from 12 VDC to zero. At this time, Q1 is turned on and +12 VDC is applied to U4-16, Q2E, and Q3E.

To reliably start the Inverter, it is essential that the first SCR turned on in the Inverter be on for only one-quarter cycle (4.15 milliseconds for a 60 Hz Inverter, 5 ms for 50 Hz). This is accomplished as follows:

- U2 pin 3 will be high until U2 times out.
- U3 is a quad NOR gate; a "1" on pins 1 and 6 controls the output at U3-11 and forces it low.

- With U2-3 high, U3-11 will be forced low. U5 is a quad NAND gate and a low input on pins 8 and 12 inhibits the output. Therefore, U5-10 and -11 will be high, biasing Q2 and Q3 off, thus holding SCR drive transistors Q4 and Q5 off.

- U10, the phase-lock loop (PLL) IC, will have a nominal signal of 240 or 200 Hz on pin 4, the VCO output. This signal is applied to the clock input of dual JK flip flop U4, which is connected as a divide-by-four counter.

- The two sections of U3 that have outputs 3 and 4 are connected as a latch controlled by U2-3. As long as U2-3 is high, U3-3 will be high. Once U2 times out, the first positive-going transition of U4-15, the 120 or 100 Hz Q out, will toggle the latch and U3-11 will go high, enabling U5 and commencing the SCR drive on a one-quarter cycle.

The collectors of Q4 and Q5 drive the primary Inverter SCR gate drive transformer. The center tap is connected to the main high voltage DC supply. The secondary of the transformer has the center tap connected to the SCR cathodes. Gate trigger current is supplied through CR3/C8, and CR4/C9 respectively. R16 and R17 provide a discharge path for C8 and C9.

U10 includes the phase detector and VCO portions of the PLL that are used to synchronize the Inverter output to the bypass line. Under normal operating conditions, the reference signal input, U10-14, and the controlled signal input, U10-3, will be in quadrature. Therefore, if the Inverter output and bypass line are to be in phase, an additional 90° phase shift is required. U8 is an integrator with a 90° phase lag. U9 is a squaring amplifier.

The combination of R34, R35, R100, R101, and C13 determines the VCO center frequency as well as the loop capture and tracking range. These are selected so that it is impossible for the loop to lock on harmonics. R37, C14, and R38 make up a lead-lag network necessary for stabilization of the PLL. Once DC voltage is applied, the oscillator will stabilize in approximately 10 seconds. Q7 and its associated gate circuitry detect the absence of line reference and modify the loop dynamics accordingly.

Both the INV AC input and the BYPASS (AUX) AC input are isolated from the VCO (U10) circuit ground by optical isolation. This isolation is necessary to prevent ground loops as well as provide isolation between the DC bus and the two AC inputs to the circuit.

Field-effect transistors (FETs) Q6 and Q8 provide zero-crossing circuits that turn on the light-emitting diode (LED) of U13 and U14 when the input signal passes through zero in the positive half-cycle. When the LED is forward-biased, the trasistor section is biased on and the resulting square wave is further squared by U5, U6, and U7. The output of U5-4 is integrated by U8 to provide a 90° phase shift. It is then resquared by U9 to drive U10-3, the input to the VCO.

The output of U7 is squared by U5. This drives VCO U10-14 to provide an input signal as well as biasing Q7 off. Q7 is biased off by a negative voltage generated on C15 by diodes CR13 and CR14.

The input to U3-8 and -9 is driven through diode CR20 in such a way that when either the INV AC input or BYPASS (AUX) AC input is present, U3-10 is held low and Q9 is held off. At initial start-up, when both INV AC input and AUX AC output are missing, U3-10 is high and Q9 is biased on. When Q9 is on, resistors R48 and R37 provide a bias to hold the VCO at center frequency.

U9-6 is held low during initial start-up via the diode CR19 from U2-3 to U9-2. This permits prebias circuit R37, R48, and Q9 to set center frequency of VCO U10-4 at 240 Hz or 200 Hz.

4.4.1 Low Battery Sensor

The low battery sensor, U12, and associated circuitry senses when the battery voltage drops below 1.75 volts per cell. It then turns off the Inverter by turning off relay drivers Q10 and Q12, and turning on Q13 which trips open CB3.

When the voltage on U12-2 drops below the set reference voltage on U12-3, the output at U12-6 goes high to turn on Q13 and provide a current path for the shunt trip coil in CB3. Q10 and Q12 turn off with a slight delay that allows CB3 to trip open before K3 opens. When the input voltage to the DSU is within specifications and the circuit breaker is turned back on, the sensor input on U12-1 causes U12-6 to go low. This turns on Q10 and Q12. In addition, Q13 turns off, closes the relay contacts in series with the battery, and restarts the Inverter by engaging CB3.

4.5 AC SENSOR AND RELAY DRIVE (See schematic 05123594)

The AC Sensor and Relay Drive Board controls the reverse transfer relay by sensing the output voltage and transferring the relay to the line when the Inverter output drops below a predetermined voltage.

To transfer the reverse transfer relay to Line, position the front panel switch to LINE. To transfer the reverse transfer switch to Inverter, position the front panel switch to INVERTER.

When the AC Sensor and Relay Drive transfers the reverse transfer from Inverter to Line, the circuit latches the relay into the Line position. To reset the relay to the Inverter position, transfer the front panel switch from LINE and then back to INVERTER.

A detailed circuit operation is as follows. Diodes CR1 and CR3 are half-wave rectified from the Line and Inverter outputs to provide DC power to the board. R1 and C2 filter the rectified wave to provide drive to R5 and CR6 to obtain a 10 to 11 VDC source which is further filtered by C4.

Diode CR2 is a half-wave rectifier which is filtered by R2 and C1 to provide an Inverter sense voltage.

Divider R4/R9 provides an input to U1-2 which is compared to the reference voltage on U1-3. The reference voltage is adjustable by R6.

U1 is a sense amplifier that switches when the voltage on U1-2 drops below the reference voltage on U1-3.

Operation in the Inverter position latches U2-4 high. The high on U2-4 drives emitter-follower Q1 on and biases triac Q2 into conduction to turn on the reverse transfer relay and drive the load from the Inverter.

When the Inverter output drops below a preset voltage, U1-6 goes high and causes U2-4 to latch low. Even though U1-6 goes back low, U2-4 will remain latched low. To reset U2-4 to a high and transfer the relay, position the switch from the Inverter position to the Line position and back to the Inverter position. When the switch returns to the Inverter position, the pulse through C3 to U2-1 will latch U2-4 high. The circuit will now automatically transfer back when the Inverter output drops low.

To transfer to the Line position with the front panel switch, place the switch to LINE to cause the relay to transfer to Line.

4.6 MODULE, MOTHER BOARD (See schematic 05132018)

Located on the Mother Board Module is the Inverter SCR drive transformer, T6, which couples the square wave output of the A1 board to the gates on the Inverter SCRs.

R20 and R18 are dropping resistors used only in 220/240 VAC applications. In 120 VAC applications there are jumpers across R20 and R18.

R17 and R19 are dropping resistors for LEDs DS1 and DS2.

R5/C5 and R6/C6 compose part of a feedback shaping filter between the Inverter and Bypass AC signals and the inputs to the PLL optical isolators.

R10 is a dropping resistor for the input to snubber 05124355 pin E11.

4.7 BRIDGE PROTECT/STATUS NETWORK (See schematic 05132014 and the System Schematic)

Varistor RV1 and capacitors C7 and C10 are used to suppress AC input transients.

C44, in combination with CR44, provides the correct voltage for AC input LED DS4.

V. OPERATING INSTRUCTIONS

5.1 CONTROLS AND INDICATORS

Circuit Breakers

AC Power	ON-OFF Circuit Breaker
DC Power	ON-OFF Circuit Breaker

Indicators

AC Input	Green
Battery Low	Red
Bypass Output	Amber
Charging Current	Amber

Contact Closures Terminal strip on rear rail

No AC Input	TB11-1/6 and -4
Low Battery	TB11-1/6 and -3
Overtemperature	TB11-1/6 and -5
No Inverter Output	TB11-1/6 and -2

Meters

AC Output Voltage	M4
AC Output Current	M3

5.2 MEANING OF INDICATORS AND CONTACT CLOSURES

Indicators

AC INPUT	Green; when lit, indicates that AC power is applied to DSU
BYPASS OUTPUT	Amber; when lit, indicates that the load is transferred to bypass power
BATTERY LOW	Red; when lit, indicates that the battery is below 63.5 $\pm$.5 V and the system will shut down in approximately 3 to 4 minutes
CHARGING CURRENT	Amber; when lit, indicates that there is charge current to the batteries

Contact Closures

NO AC INPUT	Contact closure when AC is off
NO INVERTER OUTPUT	Contact closure when the load is transferred to bypass power
BATTERY LOW	Contact closure when the battery is below 63.5 ±.5 V and the system will shut down in approximately 3 to 4 minutes
OVERTEMPERATURE	Contact closure when the temperature of the Inverter heat sink is more than 180°F (82°C)

The following indicator should be illuminated during normal operation:

AC INPUT	Green

All other lights should be out.

5.3 TURN-ON PROCEDURE

5.3.1 Make sure that both front panel circuit breakers are in the OFF position.

5.3.2 Connect the AC input and the RPs to the input terminals as described in section 2.5.

NOTE

If AC Input and Bypass Input are from the same source and are the same voltage, it is possible to connect the AC input to TB1-1 and TB1-2 (with the neutral to TB1-2). Then add jumpers between TB1-1/TB2-1 and TB1-2/TB2-2.

WARNING

This can only be done when the AC Bypass Input and DSU AC Output are of the same voltage and frequency.

5.3.3 Turn on the AC to the DSU. At this time, a relay will transfer inside the unit. The load is now powered through the DSU by Bypass Power.

The amber indicator marked BYPASS OUTPUT will illuminate.

5.3.4 Turn on the AC Input circuit breaker, CB1. After several seconds, a relay will transfer inside the unit. The batteries are now being charged.

The green indicator marked AC INPUT will illuminate.

5.3.5 Turn on the DC circuit breaker, CB3. In approximately 10 to 15 seconds, the Inverter will start and be indicated on the Output Voltage Meter.

5.3.6 If the amber light marked BYPASS OUTPUT does not go out, move the Transfer Switch to the LINE position and then back to the Inverter position.

5.3.7 At this time the load is on the Inverter output and the system is operating.

5.4 OPERATION OF REVERSE TRANSFER SWITCH

The Reverse Transfer Switch is a relay that transfers the load from the Line to the Inverter and vice versa.

This relay is driven from the AC Sensor and Relay Drive Board. (See Section 4.5 for a discussion of the AC Sensor and Relay Drive Board.)

Front Panel -- Line/Inverter Switch

5.4.1 Place the switch in the LINE position and the load will be driven from the Line.

5.4.2 Place the switch in the Inverter position and the load will be driven from the Inverter as long as the Inverter output voltage is within specification. If the Inverter voltage drops below 10% of the nominal output voltage, the sensor circuit will transfer the relay to drive the load from the line.

5.4.3 To reset the load from the Line to the Inverter, place the front panel switch to the LINE position and then back to the Inverter position. When the switch returns to the Inverter position, the relay will transfer the load back to the Inverter and stay there as long as the Inverter output is within specification.

VI. MAINTENANCE

6.1 SCOPE OF MAINTENANCE

This section includes preventive maintenance procedures, sensor levels, and other internal adjustments. Refer to Table 6-1 for test equipment requirements.

6.2 PREVENTIVE MAINTENANCE

If the atmosphere is extremely dusty, blow the dust out of the DSU every three months.

6.3 SENSORS AND ADJUSTMENTS

Adjustments are not normally required at any specific time. Sensors may be set for a specific application, or they may require a change if a circuit board or component in a particular circuit is changed.

To determine which boards and sensors are applicable to your DSU, see the List of Drawings and BOMs.

AC Sensor and Relay Driver 05123595

Inverter Low Output Voltage (10% below nominal)	R6

Battery Charger Control Board 05129826

Battery Low	R9
Equalize Voltage	R14
Reference Adjustment that Sets Charger Output Float Voltage	R35
AC Present	R44
Current Limiting	R55

Phase Lock Driver Synchronizer Board 05132025

VCO Frequency	R35
Bypass Symmetry	R31
Temperature Compensation	R101-Factory adj only
Low Battery Shutdown (59.5 $\pm$.5 VDC)	R58

TABLE 6-1
Tools and Test Equipment

EQUIPMENT	MODEL (or equivalent)
Multimeter	Simpson 260
Oscilloscope	Tektronix Model SC502
Variable AC Source	Input variacs
Adjustable load	1 KW Heater Cones and Sockets
Digital Multimeter	Fluke Model 8000A
Frequency Counter	Hewlett-Packard Model 5300B
Distortion Analyzer	Hewlett-Packard Model 331A
True RMS AC Voltmeter	Fluke Model 8030A

VII. TROUBLESHOOTING

This section contains a compilation of the probable causes of a variety of system malfunctions.

If the problem appears to originate in the power train or one of the associated circuit boards, the Theory of Operation section of this manual will prove helpful in localizing the defect to a particular component.

Another approach would be to replace the suspected board or assembly with a known good item.

Sections 7.1 and 7.2 provide troubleshooting hints for symptoms that include the tripping of circuit breakers CB1 and CB3.

Refer to table 7-1 to determine torquing requirements for screws.

TROUBLESHOOTING GUIDE

SYMPTOM	PROBABLE CAUSES	RECOMMENDED ACTION
7.1 AC INPUT CB1 TRIPS *		
	Shorted SCR or diode in Battery Charger Assembly	Remove all power and, with a VOM, test SCRs and diodes for leakage and shorts
	Shorted capacitor C1 in Battery Charger LC filter	Remove all power, isolate C1, and, with a VOM, test for a shorted cap
	Incorrect AC input voltage	Verify correct AC input voltage at TB1
	Faulty Battery Charger circuit board A2	Replace circuit board with a known good one
	Excessive temperature on Inverter SCR heatsinks causing TS2 to close	Determine the cause of high temperature, e.g. faulty fan, high ambient temperature, etc

* BATTERY CHARGER: To look for failures in the Battery Charger, it is best to turn OFF CB3 and then isolate the problem. If the problem is isolated down to the circuitry on the printed circuit board assembly, it is recommended that the board be replaced and returned to RTE Deltec for repair.

SYMPTOM	PROBABLE CAUSES	RECOMMENDED ACTION
7.2 INVERTER CB3 TRIPS		
Inverter CB3 Trips (without delay)	Shorted or excessive leakage current in the SCRs or diodes on the Inverter Assembly	Remove all power and, with a VOM, check the SCRs and diodes for shorts or excessive leakage These problems are usually caused by a damaged SCR (Q3 or Q4). Check the resistance across the SCR--A to K--with the Multimeter on the xl Ohm scale. There should not be a short in either direction when the leads are reversed. If there is a short is both directions, remove the leads connected to the SCR cathode (flag terminal) and check each SCR for a short. Replace the shorted SCR.
	Shorted capacitor C21	Remove all power, isolate C21 with a VOM, test for shorted cap
	*Faulty Driver Sync A1	Replace circuit board with a known good one
Inverter CB3 Trips (after a delay of 2 to 3 seconds)	*Faulty Gate Drive circuit or 1/4 circuit on Driver Sync board	Replace circuit board with a known good one
	*Faulty Inverter SCR	Remove all power. Check resistance gate to cathode of SCRs
	Faulty Commutating Capacitor C4	Remove all power and, with a VOM, check C4 for open or shorted condition
	Faulty ferroressonant Capacitor C3	Remove all power and, with a VOM, check C3 for a short

* Check the Driver circuit board by temporarily disconnecting the wires to terminal 3 of Inverter output transformer T2. With T2-3 disconnected, the SCR gate drive can be checked without operating the Inverter.

TABLE 7-1
Torquing Requirements

SCREW SIZE	TORQUE (IN/LBS)
4-40	4.0 ±0.5
6-32	6.5 ±0.5
8-32	15.0 ±1.0
10-24	18.0 ±1.0
10-32	25.0 ±1.0
1/4-20	61.0 ±1.5
5/16-18	122.0 ±2.0
3/8-16	202.0 ±2.5

VIII. RECOMMENDED SPARE PARTS

Those users who have maintenance facilities and technical personnel available will probably elect to perform all maintenance on the system. For these users, RTE Deltec recommends that the following spare parts be kept on hand.. The parts are listed by model number.

TOP BOM DESCRIPTION/PART NUMBER (See Note 1)	05132003 MODEL 102Y	05132003 MODEL 122X	05132002 MODEL 152Y	05132002 MODEL 182X
PLL Driver Sync Board				
05132025-5	1 ea		1 ea	
05132025-6		1 ea		1 ea
Battery Charger Board				
05129826-232 (Gell Cell)	1 ea	1 ea	1 ea	1 ea
AC Sensor and Relay Drive Bd				
05123595-2	1 ea	1 ea	1 ea	1 ea
Diode--Battery Charger				
38710115 (CR1 and CR2)	2 ea	2 ea	2 ea	2 ea
Diode--Inverter				
38710105 (CR3 and CR4)	2 ea	2 ea	2 ea	2 ea
Diode				
38710104 (CR5)	2 ea	2 ea	2 ea	2 ea
SCR--Battery Charger				
38800005 (Q1 and Q2)	2 ea	2 ea	2 ea	2 ea
SCR--Inverter				
38800010 (Q3 and Q4)	2 ea	2 ea	2 ea	2 ea
Filter Capacitor				
36201007 (C1 and C21)	1 ea	1 ea	1 ea	1 ea
Ferroresonant Capacitor				
36301028	1 ea	1 ea		
36301027 (C3)			1 ea	1 ea
Commutating Capacitor				
36302010 (C4)	1 ea	1 ea	1 ea	1 ea
Fan				
46500033 (B1)	1 ea	1 ea	1 ea	1 ea

Note 1: Determine the Model number of the unit before proceeding to review the part numbers of the assemblies.

Note 2: X can be equal to a 0 or a 1 depending on the model.
Y can be equal to a 2 or a 4 depending on the model.

RTE DELTEC

Warranty

RTE DELTEC Corporation warrants each equipment it manufactures, when properly applied and operated within specified conditions, against failure due to faulty materials or workmanship for a period of one year from the date of original shipment from the factory. The warranty covers repair or replacement of defective parts. Replacement parts are FOB RTE DELTEC's factory, while in-field warranty repair labor is FOB the RTE DELTEC Service Office nearest the installation site. Actual travel expenses from the Service Office to the job site will be borne by the customer. RTE DELTEC products repaired or replaced pursuant to this warranty shall be warranted for the unexpired portion of the warranty applying to the original product.

Excepted from this warranty is equipment which has been abused or operated outside the limits of its electrical or environmental specifications. When an alarmed failure or field test suggests that the RTE DELTEC equipment may be faulty, whether in or out of the warranty period, a full report of the difficulty should be telephoned to the Customer Service Department at the number listed below. Upon receipt of this report, the Service Department will provide the assistance required to repair the equipment.

RTE DELTEC will not be liable for any associated costs incurred by the user, installing contractor, or wholesaler as a direct or indirect result of failure or in the replacement of defective, in-warranty material unless prior approval has been granted by RTE DELTEC. **Unauthorized returns of units for in-warranty repairs will be subject to an inspection and handling charge of $150 plus any repair and all transportation charges. Authorization may be obtained from RTE DELTEC's Customer Service Department.**

Equipment repaired beyond the effective date of the warranty or when abnormal usage has occurred will be charged at applicable rates and the user will be advised of the estimate of such charges before RTE DELTEC commences repair. When ordering replacement parts, specify:

(1) Model number and serial number of the equipment,
(2) Part number, description and quantity required,
(3) Date of purchase of original equipment,
(4) Any special shipping or quotation instructions.

Any technical advice furnished before or after delivery in regard to use or application of RTE DELTEC's equipment is furnished without charge and on the basis that it represents RTE DELTEC's best judgment under the circumstances, but it is used at the recipient's sole risk.

This warranty is expressly in lieu of all other warranties, expressed or implied, including, without limitation, any implied warranty or merchantability or fitness for a particular purpose, and of any other obligation or liability on the part of RTE DELTEC. The sole and exclusive remedy for breach of any warranty, express or implied, concerning RTE DELTEC products and the only obligation of RTE DELTEC hereunder shall be the repair or replacement of defective equipment, components, or parts; or, at RTE DELTEC's option, refund of the purchase price or substitution with a new replacement product. RTE DELTEC shall in no way be responsible for consequential damages of any kind or nature whatsoever resulting from the breach of any warranty, express or implied.

RTE DELTEC Corporation
2727 Kurtz Street
San Diego, California 92110
Toll Free: (800) 854-2658
In California: (619) 291-4211
TWX: 910-335-1241

X. BILLS OF MATERIAL (BOMS)

The following BOMs comprise Section X of this manual and are presented in numerical order as shown.

Part Number	Title
05123595	AC Sensor & Relay Driver
05124355	Snubber/Filter DSU 500-1800
05129826	Battery Charger Control 1 Phase
05132002	DSU 1500-1800
05132003	DSU 1000-1200
05132009	Panel, Front DSU 1000-1800
05132010	Power/Semicond Heat Sink 1000-1800
05132011	Harness DSU 1000-1800
05132012	Bridge Protec/Status Network
05132018	Module, Mother Board
05132025	PLL Driver Sensor

BOM 05123595 AC SENSOR/RELAY DR REVISION: L

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05123593	PCB BD AC SENSOR RELAY	1.00	'
05123594	SCH AC SENS/RELAY DR PC A	.00	'
05123596	ASY AC SENS/RELAY DR PC A	.00	'
05133006	T/P AC SENSOR/RELAY DR PC	.00	'
30151102	RES C 1K 1/4W 5%	2.00	R7,R13
30151103	RES C 10K 1/4W 5%	4.00	R10.16.12R14
30151104	RES C 100K 1/4W 5%	1.00	R11
30154102	RES C 1K 2W 5%	1.00	R1
30154682	RES C 6.8K 2W 5%	1.00	R5
32302322	RES MF 23.2K 1/4W 1%	1.00	R2
32303321	RES MF 3.32K 1/4W 1%	1.00	R8
32304991	RES MF 4.99K 1/4W 1%	2.00	R3.9
32309532	RES MF 95.3K 1/4W 1%	1.00	R4
34201202	RES VAR 2K CERMET	1.00	R6
36102024	CAP ALEC 10MFD 250V A	2.00	C1,C2
36601000	CAP SOLTA 2.2MFD 35V	2.00	C4,C6
37101000	CAP CER .1MF 12V MIN	2.00	C3.C5
38640030	XSTR 2N2222A	1.00	Q1
38720010	DIODE AXLD 1N4148	3.00	CR4.7.8.
38720030	DIODE AXLD 1N4006G	3.00	CR1-CR3
38800017	SCR HI33SS/HI43SS/2300D	1.00	Q2
38910050	DIODE ZNR 1N758	1.00	CR6
40600001	IC DGTL 741 DIP OP AMP	1.00	U1
40611007	IC QUAD 2 NOR CD400	1.00	U2
48301006-9	MOLEX 09-18-5121 WHITE	1.00	J1-42
60202805	WIRE 28GA UL1429 SOLID	.00	

BOM 05123595-1 AC SEN/RLY 120V W/O LED REVISION: K

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05123595	AC SENSOR/RELAY DR	1.00	BASIC
30151101	RES C 100 OHM 1/4W 5%	1.00	R17

BOM 05123595-2 AC SEN/RLY 120V W LED REVISION: L

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05123595	AC SENSOR/RELAY DR	1.00	
30151101	RES C 100 OHM 1/4W 5%	1.00	R17
30151102	RES C 1K 1/4W 5%	1.00	R15
37100003	CAP CER .01UF 500V	1.00	C7
38640030	XSTR 2N2222A	1.00	Q3
38720010	DIODE AXLD 1N4148	1.00	CR5
OV COST	OUT SIDE VENDOR COST	2.86	

BOM 05123595-3 AC SEN/RLY 220/240V W LED REVISION: L

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05123595	AC SENSOR/RELAY DR	1.00	
30151102	RES C 1K 1/4W 5%	1.00	R15
32304752	RES MF 47.5K 1/4W 1%	1.00	R18
37100003	CAP CER .01UF 500V	1.00	C7
38640030	XSTR 2N2222A	1.00	Q3
38720010	DIODE AXLD 1N4148	1.00	CR5

ONE BOM PART NUM SEQUENCE

BOM 05124355 SNUBBER/FILTER DSU 500-1800 REVISION: P

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05124356	ASY SNUBBER/FLTR DSU500-1	.00	'
05124357	SNUBBER & SWITCH BOARD	1.00	5
05132029	SCH SNUBBER/FILER DSU	.00	'
30151102	RES C 1K 1/4W 5%	1.00	R9
30151203	RES C 20K 1/4W 5%	1.00	R6
30151473	RES C 47K 1/4W 5%	1.00	R5
30152391	RES C 390 OHM 1/2W 5%	2.00	R1,R2
30152683	RES C 68K 1/2W 5%	2.00	R3,R4
30154472	RES C 4.7K 2W 5%	2.00	R7,R8
35102005	CAP FILM .22UF 220V 20%	2.00	C1,C2
37103001	CAP CER .01UF 100V	1.00	C3
38640230	XSTR 2N5416	1.00	19-Q2
38640236	XSTR MPS-U57	1.00	20-Q1
38720020	DIODE AXLD 1N4003G	1.00	CR1
38920009	DIODE ZNR 1W 1N4752	1.00	CR2
44300030	PHMS PHH 4-40X1/2	1.00	25
44500003	NUT HEX 4-40	1.00	26
44620005	WSHR.LK SPLIT #4	1.00	32
44700003	WSHR.FLAT #4	2.00	27
44711011	WASHER SHOULDER #5	1.00	33
45700002	WSHR SHLDR NYLON #6 ID	4.00	29
45711007	SPACER.AL,.25DX.125L	1.00	31
62100012	HEATSINK FOR TO220	1.00	30FORQ1
71100004	SPACER INS. TR-PAD TO-5	.00	28
OV COST	OUT SIDE VENDOR COST	1.00	

ONE BOM PART NUM SEQUENCE

BOM 05129826 BC CONTROL 1 PH REVISION: E

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129827	ASY BC CONT 1 PH	.00	'
05129828	SCH BC CONT 1 PH	.00	'
05129829	PCB BC CONT 1 PH	1.00	'
05130185	PRC 1PH BATTERY CHGR CONT	.00	'
30151101	RES C 100 OHM 1/4W 5%	2.00	R26,28
30151102	RES C 1K 1/4W 5%	3.00	R21,22,34
30151103	RES C 10K 1/4W 5%	12.00	R41,60,61R63,66,72R73-7
30151152	RES C 1.5K 1/4W 5%	1.00	R38
30151153	RES C 15K 1/4W 5%	3.00	R20,23,58
30151203	RES C 20K 1/4W 5%	3.00	R65,62,59
30151272	RES C 2.7K 1/4W 5%	1.00	R33
30151470	RES C 47 OHM 1/4W 5%	1.00	R56
30151472	RES C 4.7K 1/4W 5%	1.00	R52
30151473	RES C 47K 1/4W 5%	1.00	R39
30151474	RES C 470K 1/4W 5%	1.00	R40
30151512	RES C 5.1K 1/4W 5%	3.00	R36,57,64
30151563	RES C 56K 1/4W 5%	1.00	R53
30151683	RES C 68K 1/4W 5%	2.00	R37,67
30152152	RES C 1.5K 1/2W 5%	1.00	R42
30153100	RES C 10 OHM 1W 5%	2.00	R25,27
30153102	RES C 1K 1W 5%	2.00	R51,68
30153200	RES C 20 OHM 1W 5%	1.00	R-24
30153241	RES C 240 OHM 1W 5%	1.00	R29
32304991	RES MF 4.99K 1/4W 1%	1.00	R32
32305112	RES MF 51.1K 1/4W 1%	1.00	R54
35100104	CAP METMYL .1MF 50V MIN	1.00	C24
35100105	CAP METMYL 1UF 50V MIN 10	2.00	C12,19
36101005	CAP ALEC 100MF 25V	2.00	C11,15
36102001	CAP ALEC 33MF 16V	1.00	C-18
36104003	CAP ALEC 250UF/30VDC	1.00	C-10
36601000	CAP SOLTA 2.2MFD 35V	2.00	C8,9
37100000	CAP CER .001MF 1000V	1.00	C7
37103001	CAP CER .01UF 100V	7.00	C13,14,16C20-23
38640040	XSTR 2N2907A	1.00	Q9
38640230	XSTR 2N5416	1.00	Q6
38640232	XSTR 2N5682	2.00	Q4,5
38720010	DIODE AXLD 1N4148	5.00	CR26-28CR33&35
38720020	DIODE AXLD 1N4003G	7.00	CR18-23,CR25
38720040	DIODE AXLD 1N4933	8.00	CR10-17
38910010	DIODE ZNR 1N750	1.00	CR32
38920000	DIODE ZNR 1W 1N4734	1.00	CR31
38920010	DIODE ZNR 1W 1N4742	1.00	CR24
40600001	IC DGTL 741 DIP OP AMP	1.00	U5
40600004	IC QUAD COMPARATOR LM339N	1.00	U4
40620005	IC REGULATOR LM72	1.00	U3
71100004	SPACER INS. TR-PAD TO-5	1.00	FOR Q6

BOM 05129826-010 BC TIMER/AUTO EQUALIZE CKT REVISION: G

PART NUMBER	DESCRIPTION		QTY EACH	REFERENCE DESIGNATOR(S)
30151100	RES C 10 OHMS 1/4W 5%		2.00	R4,7
30151103	RES C 10K 1/4W 5%		5.00	R10,70,71R79,80
30151104	RES C 100K 1/4W 5%		6.00	R11,12,15R16,17,19
30151105	RES C 1 MEG 1/4W 5%		1.00	R5
30151203	RES C 20K 1/4W 5%		3.00	R2,18,48
30151473	RES C 47K 1/4W 5%		1.00	R3
30151512	RES C 5.1K 1/4W 5%		1.00	R8
30151754	RES C 750K 1/4W 5%		1.00	R6
30152152	RES C 1.5K 1/2W 5%		1.00	R69
36601002	CAP SOLTA 10UF 20V		3.00	C1,2,3
37100000	CAP CER .001MF 1000V		2.00	C26,27
37103001	CAP CER .01UF 100V		4.00	C4,5,6,25
38640030	XSTR 2N2222A		3.00	Q1,2,3
38720010	DIODE AXLD 1N4148		6.00	CR3-CR8
38910010	DIODE ZNR 1N750		1.00	CR2
38920010	DIODE ZNR 1W 1N4742		1.00	CR1
40611007	IC QUAD 2 NOR	CD400	1.00	U2
40611019	IC 14STAGE BIN RIP	CD406	1.00	U1

BOM 05129826-020 BC DSU BAT LOW CKT REVISION: F

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
30151162	RES C 1.6K 1/4W 5%	1.00	R81
30151334	RES C 330K 1/4W 5%	1.00	R45
30151472	RES C 4.7K 1/4W 5%	1.00	R50
30152273	RES C 27K 1/2W 5%	2.00	R46,47
30153153	RES C 15K 1W 5%	1.00	R43
30154681	RES C 680 OHM 2W 5%	1.00	R49
37100000	CAP CER .001MF 1000V	1.00	C17
38640030	XSTR 2N2222A	1.00	Q8
38640130	XSTR 2N3439	1.00	Q7
38640244	XSTR 2N2219A	1.00	Q10
38910010	DIODE ZNR 1N750	1.00	CR29
38910021	DIODE ZNR 1N754A	1.00	CR30
71100004	SPACER INS, TR-PAD TO-5	2.00	FORQ7,Q10

BOM 05129826-111 BC CONT 5000A PCBA 125V 1PH REVISION: K

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05123801	T GDR .1W1 12 3.8T 20K HZ	1.00	T2
05129826	BC CONTROL 1 PH	1.00	'
05129826-010	BC TIMER/AUTO EQUALIZE CK	1.00	'
05130099-8	C/I FROM 05129826-232 TO	.00	'
30151513	RES C 51K 1/4W 5%	1.00	R-30
32301403	RES MF 140K 1/4W 1%	1.00	R-31
33252027	RES CER W.W 10K, 3 1/4W,	1.00	R-1
34201101	RES VAR 100 OHM CERMET	1.00	R55
34201104	RES VAR 100K CERMET	1.00	R14
34201502	RES VAR 5K CERMET	2.00	R35,R9
48910001	BB TERMINALS, TURRET	11.00	TP1-11
50300001	5082-4650 PNL MNTD LED RE	1.00	DS1
55303203	SW TOGGLE PCB MT 7105MD	1.00	S1
60414109	JUMPER SLEEVED .25X.25 22	1.00	B-D
67100007	T1 1 PHASE BC 1 SIZE	1.00	T1
71100003	SPACER, INS TR-PAD .20 X	1.00	FOR DS1
OV COST	OUT SIDE VENDOR COST	6.30	

BOM 05129826-121 BC CONT 5000A NICAD 125V 1PH REVISION: K

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129826-111	BC CONT 5000A PCBA 125V	1.00	'
05130099-1	C/I BC BD 1PH -111 TO -12	.00	'
30151100	RES C 10 OHMS 1/4W 5%	1.00	R13
32302552	RES MF 25.5K 1/4W 1%	1.00	R30

BOM 05129826-212 BC CONT DSU PBCA 84V 1PH REVISION: K

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129826-020	BC DSU BAT LOW CKT	1.00	'
05129826-111	BC CONT 5000A PCBA 125V	1.00	'
05130099-5	C/I BC BD 1PH -111 TO -21	.00	'
30151203	RES C 20K 1/4W 5%	1.00	R30
30154682	RES C 6.8K 2W 5%	1.00	R1
32308252	RES MF 82.5K 1/4W 1%	1.00	R31
34201202	RES VAR 2K CERMET	1.00	R44
38720010	DIODE AXLD 1N4148	1.00	CR34
60414110	JUMPER .35X.25T22GA INS	2.00	B-C & A-D

BOM 05129826-222 BC CONT DSU NICAD 84V 1PH REVISION: J

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129826-020	BC DSU BAT LOW CKT	1.00	'
05129826-111	BC CONT 5000A PCBA 125V	1.00	'
05130099-4	C/I BC BD 1PH -111 TO -22	.00	'
30151100	RES C 10 OHMS 1/4W 5%	1.00	R13
30151203	RES C 20K 1/4W 5%	1.00	R-30
30154682	RES C 6.8K 2W 5%	1.00	R1
32308252	RES MF 82.5K 1/4W 1%	1.00	R31
34201202	RES VAR 2K CERMET	1.00	R44
38720010	DIODE AXLD 1N4148	1.00	CR34
60414110	JUMPER .35X.25T22GA INS	2.00	B-C & A-D

BOM 05129826-232 BC CONT DSU GELCEL 84V 1PH REVISION: H

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05123801	T GDR .1W1 12 3.8T 20K HZ	1.00	T2
05129826	BC CONTROL 1 PH	1.00	'
05129826-020	BC DSU BAT LOW CKT	1.00	'
30151203	RES C 20K 1/4W 5%	1.00	R-30
30154682	RES C 6.8K 2W 5%	1.00	R1
32308252	RES MF 82.5K 1/4W 1%	1.00	R31
34201101	RES VAR 100 OHM CERMET	1.00	R55
34201202	RES VAR 2K CERMET	1.00	R44
34201502	RES VAR 5K CERMET	1.00	R35
38720010	DIODE AXLD 1N4148	1.00	CR34
48910001	BB TERMINALS, TURRET	7.00	TP3-9
60414110	JUMPER .35X.25T22GA INS	2.00	A-D & C-B
67100007	T1 1 PHASE BC 1 SIZE	1.00	T1
OV COST	OUT SIDE VENDOR COST	5.16	

BOM 05129826-311 BC CONT 5000A PCBA 48V 1PH REVISION: L

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129826-111	BC CONT 5000A PCBA 125V	1.00	'
05130099-3	C/I BC BD 1PH -111 TO -31	.00	'
05130099-9	C/I FROM 05129826-232 TO	.00	'
30151203	RES C 20K 1/4W 5%	1.00	R30
30154302	RES C 3K 2W 5%	1.00	R-1
32305112	RES MF 51.1K 1/4W 1%	1.00	R31
60414110	JUMPER .35X.25T22GA INS	2.00	B-C , A-D

BOM 05129826-321 BC CONT 5000A NICAD 48V 1PH REVISION: K

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129826-111	BC CONT 5000A PCBA 125V	1.00	'
05130099-2	C/I BC BD 1PH -111 TO -32	.00	'
30151100	RES C 10 OHMS 1/4W 5%	1.00	R-13
30151203	RES C 20K 1/4W 5%	1.00	R30
30154302	RES C 3K 2W 5%	1.00	R-1
32305112	RES MF 51.1K 1/4W 1%	1.00	R31
60414110	JUMPER .35X.25T22GA INS	2.00	B-C , A-D

BOM 05132002 DSU 1500-1800 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05122695	CHKE COM 1.8K1 84	1.00	11-L2
05123595-2	AC SEN/RLY 120V W L	1.00	13-A4
05129260	BASE,DSU 1000/1800	1.00	1
05129261	SIDE,L.H. DSU 1000/1800	1.00	2
05129262	SIDE,R.H. DSU 1000/1800	1.00	3
05129265	COVER,TOP DSU 1000/1800	1.00	6
05129639	L BATTERY CHARGER	1.00	10-L1
05129757	TRAY COMPONENT	1.00	4
05129993	CORNER BLOCK	1.00	'
05129994	PALLET SHIPPING-DSU/RP20	1.00	'
05130283-0	LABEL GOULD-DELTEC PN/SN	1.00	121
05130377	MANUAL, DSU 20 SERIES 318	1.00	'
05130864	T/P DSU 500-1800 30 SERIE	.00	'
05131747	BRACKET, DIODE	1.00	60FORCR5
05131993	ASY,DSU 1000-1800	.00	'
05132004	SCH, SYSTEM,DSU 500-1800	.00	'
05132005	W/L DSU 1000-1800	.00	'
05132010	PWR/SEMICOND HT/SK 1000-1	1.00	9
05132011	HARNESS DSU 1000-1800	1.00	'
05132238	CONTAINER,SHIPPING	1.00	'
33157302	RES WW 3K 8W	2.00	17-R1,R21
36201007	CAP ALEC 7800MF 200V	2.00	15-C1,C21
36302010	CAP OIL COMM 15MF 400V	1.00	34-C4
36303004	CAP SOG FOIL 54MFD 71/4"6	1.00	'
37104001	CAP CER .1MF 500V	1.00	99-C22
38710104	DIODE RECT 1N2134	1.00	11-CR5
44300001	PHMS PHH 4-40X3/8	2.00	31
44300005	PHMS PHH 6-32X3/4	3.00	60
44300007	PHMS PHH 8-32X3/8	17.00	27
44300009	PHMS PHH 8-32X5/8	4.00	30FORTB33
44300014	PHMS PHH 6-32X3/8	10.00	22
44300019	PHMS PHH 10-32X3/8	45.00	37
44300024	PHMS PHH 10-32X1/2	12.00	21
44300034	PHMS PHH 2-56X5/16	2.00	131FORR3
44300036	PHMS PHH 10-32X3/4	4.00	24
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT2
44500004	NUT HEX 6-32	2.00	69
44500006	NUT HEX 10-32	1.00	88FORENDSTUD
44500023	NUT HEX 3-48	2.00	92FORK3

BOM 05132002 DSU 1500-1800 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
44600003	WSHR.LK.INTL TOOTH #4	2.00	59
44600005	WSHR.LK.INTL TOOTH #8	5.00	182
44620001	WSHR.LK SPLIT 1/4	4.00	20FORT2
44620002	WSHR.LK SPLIT #10	54.00	43
44620003	WSHR.LK SPLIT #6	13.00	50
44620008	WSHR.LK SPLIT #8	16.00	49
44620009	WSHR.LK SPLIT #2	2.00	133FORR3
44700001	WSHR.FLAT #2	2.00	132FORR3
44700006	WSHR.FLAT #10	9.00	40
44700007	WSHR.FLAT 1/4	5.00	29FORT2
45100005	GROM. NYL (FOR .085 THK P	.00	35FOR4
45610009	CLAMP. HARNESS 3/8	4.00	180
45610018	TAB.MTG. ADHESIVE BACKED.	2.00	151
45610024	SPRL WRP.1/2 (POLYETHYLEN	.00	152
45610026	CLAMP.HARNESS.1/2"-5/8"	3.00	185
45610027	CLAMP.HARNESS, 7/8"-1.0"	2.00	52
45620006	CLAMP CAP (FOR 3.0 DIA CA	2.00	,C2123FORC1
45620022	CLAMP CAP (FOR 4.75 HI CA	2.00	26FORC4
45620023	CLAMP CAP (FOR 7.25 HI CA	2.00	28FORC3
48100008	CINCH 50-PK-2 POLARIZING	2.00	96A1J2,A2J6
48800016	TERM.RING,CRIMP.18-22GA,1	.00	62FORR1C22
48800017	TERM.RING,CRIMP,18-22GA,#	.00	100FORC22
53601010	HEATSINK COMPOUND DIELECT	.00	134FORR2,R3,R10
53601012	THREAD LOCK COMPOUND (BLU	.00	61
57100103	RELAY DPDT 120VAC 25A	1.00	K4
57100129	RELAY 110VDC COIL	1.00	K3
60411003	TEFLON THIN WALL TUBING	.00	101FORC22
70514001	PAD,FOAM	1.00	16

BOM 05132002-111 DSU 1820 120/120 6 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05128789	XFMR INV 1.8K1 72 120T	1.00	45-T2
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05131960	BAFFLE	1.00	175
05132002	DSU 1500-1800	1.00	BASIC
05132005-1	W/L DSU 120 120 W/TB111	.00	'
05132009-4	PANEL,FRONT DSU 1820 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44300009	PHMS PHH 8-32X5/8	4.00	30FOR44
44330002	SCW CAP HEXHD 1/4-20X3/4	2.00	25FORBAFFLE
44620001	WSHR.LK SPLIT 1/4	6.00	20
44700007	WSHR.FLAT 1/4	2.00	29FORBAFFLE
48500002	TB 30A AT SCW # 8	1.00	44-TB111

BOM 05132002-212 DSU 1522 220/220 5 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129169	T B/C 1.8K1 240T 120	1.00	48-T1
05129236	XFMR INV 1.5K1 72 240T	1.00	45-T2
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05132002	DSU 1500-1800	1.00	BASIC
05132005-3	W/L DSU 220 220 W/T1	.00	'
05132009-3	PANEL,FRONT DSU 1522 OR 1	1.00	8
05132025-5	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44300002	PHMS PHH 4-40X7/8	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132002-214 DSU 1821 220/120 XTAL DR REVISION: A

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05122668-4	DR SENSOR DSU 72VDC	1.00	38-A1
05128789	XFMR INV 1.8K1 72 120T	1.00	45-T2
05129169	T B/C 1.8K1 240T 120	1.00	48-T1
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05132002	DSU 1500-1800	1.00	BASIC
05132005-6	W/L DSU 220 120 W/T1	.00	
05132009-4	PANEL,FRONT DSU 1820 OR 1	1.00	8
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25 FOR T1
44620001	WSHR,LK SPLIT 1/4	4.00	20 FOR T1
44700007	WSHR,FLAT 1/4	4.00	29 FOR T1

BOM 05132002-311 DSU 1821 120/120 6 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05128789	XFMR INV 1.8K1 72 120T	1.00	45-T2
05129169	T B/C 1.8K1 240T 120	1.00	48-T1
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05131539	C/I DSU1820 TO DSU1821	.00	'
05132002	DSU 1500-1800	1.00	BASIC
05132005-2	W/L DSU 120 120 W/T1	.00	'
05132009-4	PANEL,FRONT DSU 1820 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	2FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132002-413 DSU 1524 240/240 5 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129902	C/I DSU 700-1800 220 TO 2	.00	'
05130283-0	LABEL GOULD-DELTEC PN/SN	1.00	121
05132002-212	DSU 1522 220/220	1.00	'

BOM 05132002-511 DSU 1820 120/120 RFI/EMI 6 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05128789	XFMR INV 1.8K1 72 120T	1.00	45-T2
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05131960	BAFFLE	1.00	175
05132002	DSU 1500-1800	1.00	BASIC
05132005-15	W/L DSU DASH 1 WITH RFI/E	.00	'
05132009-4	PANEL,FRONT DSU 1820 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44300009	PHMS PHH 8-32X5/8	4.00	30FOR44
44330002	SCW CAP HEXHD 1/4-20X3/4	2.00	25FORBAFFLE
44620001	WSHR,LK SPLIT 1/4	6.00	49FOR44
44700007	WSHR,FLAT 1/4	2.00	29FORBAFFLE
48500002	TB 30A AT SCW # 8	1.00	44-TB111

BOM 05132002-612 DSU 1522 220/220 RFI/EMI 5 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129169	T B/C 1.8K1 240T 120	1.00	48-T1
05129236	XFMR INV 1.5K1 72 240T	1.00	45-T2
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05132002	DSU 1500-1800	1.00	
05132005-35	W/L DSU DASH 3 WITH RFI/E	.00	
05132009-3	PANEL,FRONT DSU 1522 OR 1	1.00	8
05132025-5	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25 FOR T1
44620001	WSHR,LK SPLIT 1/4	4.00	20 FOR T1
44700007	WSHR,FLAT 1/4	4.00	29 FOR T1

BOM 05132002-614 DSU 1821 220/120 RFI/EM1 6 REVISION: B

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05122668-4	DR SENSOR DSU 72VDC	1.00	38-A1
05128789	XFMR INV 1.8K1 72 120T	1.00	45-T2
05129169	T B/C 1.8K1 240T 120	1.00	48-T1
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05132002	DSU 1500-1800	1.00	BASIC
05132005-65	W/L DSU DASH 6 WITH RFI/E	.00	'
05132009-4	PANEL,FRONT DSU 1820 OR 1	1.00	8
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132002-631 DSU 1821 220/120 RFI/EMI 6 REVISION: D

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05122668-4	DR SENSOR DSU 72VDC	1.00	38-A1
05128789	XFMR INV 1.8K1 72 120T	1.00	45-T2
05129169	T B/C 1.8K1 240T 120	1.00	T1
05129826-212	BC CONT DSU PBCA 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05132002	DSU 1500-1800	1.00	BASIC
05132005-65	W/L DSU DASH 6 WITH RFI/E	.00	'
05132009-4	PANEL,FRONT DSU 1820 OR 1	1.00	8
05133318	C/I SWITCH EQUALIZE DSU	.00	'
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1
48312006	CONN 10-12GA 2P 50A 631	1.00	P3

BOM 05132002-711 DSU 1821 120/120 RFI/EMI 6 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05128789	XFMR INV 1.8K1 72 120T	1.00	45-T2
05129169	T B/C 1.8K1 240T 120	1.00	48-T1
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05132002	DSU 1500-1800	1.00	BASIC
05132005-25	W/L DSU DASH 2 WITH RFI/E	.00	'
05132009-4	PANEL,FRONT DSU 1820 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132003 DSU 1000/1200 REVISION: E

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05122695	CHKE COM 1.8K1 84	1.00	11-L2
05123595-2	AC SEN/RLY 120V W L	1.00	13-A4
05129260	BASE,DSU 1000/1800	1.00	1
05129261	SIDE.L.H. DSU 1000/1800	1.00	2
05129262	SIDE.R.H. DSU 1000/1800	1.00	3
05129265	COVER.TOP DSU 1000/1800	1.00	6
05129639	L BATTERY CHARGER	1.00	10-L1
05129724	DET CLAMP.CAP	1.00	28FORC3
05129757	TRAY COMPONENT	1.00	4
05129993	CORNER BLOCK	1.00	'
05129994	PALLET SHIPPING-DSU/RP20	1.00	'
05130283-0	LABEL GOULD-DELTEC PN/SN	1.00	121
05130377	MANUAL, DSU 20 SERIES 318	1.00	'
05130864	T/P DSU 500-1800 30 SERIE	.00	'
05131535-5	GLASTIC 1/16THK 3.00X 5.0	.00	'
05131747	BRACKET, DIODE	1.00	6FORCR5
05131993	ASY,DSU 1000-1800	.00	'
05132004	SCH, SYSTEM,DSU 500-1800	.00	'
05132005	W/L DSU 1000-1800	.00	'
05132010	PWR/SEMICOND HT/SK 1000-1	1.00	9
05132011	HARNESS DSU 1000-1800	1.00	'
05132238	CONTAINER,SHIPPING	1.00	'
33157302	RES WW 3K 8W	2.00	17-R1,R21
36201007	CAP ALEC 7800MF 200V	2.00	15-C1,C21
36301028	CAP OIL ALEC 18UF 660V 3%	2.00	33-C3
36302010	CAP OIL COMM 15MF 400V	1.00	34-C4
37104001	CAP CER .1MF 500V	1.00	99-C22
38710104	DIODE RECT 1N2134	1.00	11CR5
44300001	PHMS PHH 4-40X3/8	2.00	31
44300005	PHMS PHH 6-32X3/4	3.00	60
44300007	PHMS PHH 8-32X3/8	17.00	27
44300009	PHMS PHH 8-32X5/8	4.00	30FORTB33
44300014	PHMS PHH 6-32X3/8	10.00	22
44300019	PHMS PHH 10-32X3/8	45.00	37
44300024	PHMS PHH 10-32X1/2	10.00	21
44300034	PHMS PHH 2-56X5/16	2.00	131FORR3
44300036	PHMS PHH 10-32X3/4	4.00	24
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT2
44500004	NUT HEX 6-32	2.00	69

BOM 05132003 DSU 1000/1200 REVISION: E

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
44500006	NUT HEX 10-32	1.00	88FORGNDSTUD
44600003	WSHR,LK,INTL TOOTH #4	2.00	59
44600005	WSHR,LK,INTL TOOTH #8	5.00	182
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT2
44620002	WSHR,LK SPLIT #10	52.00	43
44620003	WSHR,LK SPLIT #6	13.00	50
44620008	WSHR,LK SPLIT #8	16.00	49
44620009	WSHR,LK SPLIT #2	2.00	133FORR3
44700001	WSHR,FLAT #2	2.00	132FORR3
44700006	WSHR,FLAT #10	9.00	40
44700007	WSHR,FLAT 1/4	5.00	29FORT2
45100005	GROM, NYL (FOR .085 THK P	.00	35FOR4
45610009	CLAMP, HARNESS 3/8	4.00	'
45610018	TAB,MTG, ADHESIVE BACKED,	2.00	151
45610023	CLAMP CABLE 1"ID RUB-INSO	1.00	52FORT2
45610024	SPRL WRP,1/2 (POLYETHYLEN	.00	152
45610026	CLAMP,HARNESS,1/2"-5/8"	3.00	185
45610027	CLAMP,HARNESS, 7/8"-1.0"	2.00	52
45620006	CLAMP CAP (FOR 3.0 DIA CA	2.00	,C2123FORC1
45620022	CLAMP CAP (FOR 4.75 HI CA	2.00	26FORC4
48100008	CINCH 50-PK-2 POLARIZING	2.00	96A1J2,A2J6
48800016	TERM,RING,CRIMP,18-22GA,1	.00	62FORR1C22
48800017	TERM,RING,CRIMP,18-22GA,#	.00	100-FOR22
53601010	HEATSINK COMPOUND DIELECT	.00	134FORR10,2,3
53601012	THREAD LOCK COMPOUND (BLU	.00	61
57100103	RELAY DPDT 120VAC 25A	1.00	K4
57100129	RELAY 110VDC COIL	1.00	K3
60411003	TEFLON THIN WALL TUBING	.00	101-FORC22
70514001	PAD,FOAM	1.00	16

BOM 05132003-111 DSU 1220 120/120 6 REVISION: D

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129279	XFMR INV 1.2K1 84 120	1.00	'
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05131960	BAFFLE	1.00	175
05132003	DSU 1000/1200	1.00	BASIC
05132005-1	W/L DSU 120 120 W/TB111	.00	'
05132009-2	PANEL,FRONT DSU 1220 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	2.00	25FORBAFFLE
44620001	WSHR,LK SPLIT 1/4	2.00	20FORBAFFLE
44700007	WSHR,FLAT 1/4	2.00	29FORBAFFLE

BOM 05132003-211 DSU 1221 220 50HZ/120 60HZ REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05122668-4	DR SENSOR DSU 72VDC	1.00	'
05129167	BOM XFMR B/C 1.2K1 240T12	1.00	48-T1
05129279	XFMR INV 1.2K1 84 120	1.00	45-T2
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05132003	DSU 1000/1200	1.00	BASIC
05132005-6	W/L DSU 220 120 W/T1	.00	'
05132009-2	PANEL,FRONT DSU 1220 OR 1	1.00	8
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132003-212 DSU 1022 220/220 5 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129167	BOM XFMR B/C 1.2K1 240T12	1.00	48-T1
05129281	XFMR INV 1.K1 72 240T	1.00	45-T2
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05132003	DSU 1000/1200	1.00	BASIC
05132005-3	W/L DSU 220 220 W/T1	.00	'
05132009-1	PANEL,FRONT DSU 1022 OR 1	1.00	8
05132025-5	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132003-311 DSU 1221 120/120 6 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129167	BOM XFMR B/C 1.2K1 240T12	1.00	48-T1
05129279	XFMR INV 1.2K1 84 120	1.00	'
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05131538	C/I DSU1220 TO DSU1221	.00	'
05132003	DSU 1000/1200	1.00	BASIC
05132005-2	W/L DSU 120 120 W/T1	.00	'
05132009-2	PANEL,FRONT DSU 1220 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132003-331 DSU 1221 120/120 LD ACD REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129167	BOM XFMR B/C 1.2K1 240T12	1.00	48-T1
05129279	XFMR INV 1.2K1 84 120	1.00	45-T2
05129826-212	BC CONT DSU PBCA 84V	1.00	12-A2
05130354-1	PNL REAR STD	1.00	7
05131538	C/I DSU1220 TO DSU1221	.00	'
05132003	DSU 1000/1200	1.00	BASIC
05132005-2	W/L DSU 120 120 W/T1	.00	'
05132009-2	PANEL,FRONT DSU 1220 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
05133318	C/I SWITCH EQUALIZE DSU	.00	'
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1
48312006	CONN 10-12GA 2P 50A 631	1.00	P3

BOM 05132003-413 DSU 1024 240/240 5 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129902	C/I DSU 700-1800 220 TO 2	.00	'
05130283-0	LABEL GOULD-DELTEC PN/SN	1.00	121
05132003-212	DSU 1022 220/220	1.00	'

BOM 05132003-511 DSU 1220 120/120 RFI/EMI 6 REVISION: D

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129279	XFMR INV 1.2K1 84 120	1.00	'
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05131960	BAFFLE	1.00	175
05132003	DSU 1000/1200	1.00	BASIC
05132005-15	W/L DSU DASH 1 WITH RFI/E	.00	'
05132009-2	PANEL,FRONT DSU 1220 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	2.00	25FORBAFFLE
44620001	WSHR,LK SPLIT 1/4	2.00	20FORBAFFLE
44700007	WSHR,FLAT 1/4	2.00	29FORBAFFLE

BOM 05132003-612 DSU 1022 220/220 RFI/EMI 5 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129167	BOM XFMR B/C 1.2K1 240T12	1.00	48-T1
05129281	XFMR INV 1.K1 72 240T	1.00	45-T2
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05132003	DSU 1000/1200	1.00	BASIC
05132005-35	W/L DSU DASH 3 WITH RFI/E	.00	'
05132009-1	PANEL,FRONT DSU 1022 OR 1	1.00	8
05132025-5	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132003-622 DSU 1022 220/220 RFI/EMI 5 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129167	BOM XFMR B/C 1.2K1 240T12	1.00	48-T1
05129281	XFMR INV 1.K1 72 240T	1.00	45-T2
05129826-222	BC CONT DSU NICAD 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05132003	DSU 1000/1200	1.00	BASIC
05132005-35	W/L DSU DASH 3 WITH RFI/E	.00	'
05132009-1	PANEL,FRONT DSU 1022 OR 1	1.00	8
05132025-5	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
05133318	C/I SWITCH EQUALIZE DSU	.00	'
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132003-711 DSU 1221 120/120 RFI/EMI 6 REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129167	BOM XFMR B/C 1.2K1 240T12	1.00	48-T1
05129279	XFMR INV 1.2K1 84 120	1.00	'
05129826-232	BC CONT DSU GELCEL 84V	1.00	12-A2
05130354-2	PNL REAR RFI/EMI	1.00	7
05132003	DSU 1000/1200	1.00	BASIC
05132005-25	W/L DSU DASH 2 WITH RFI/E	.00	'
05132009-2	PANEL,FRONT DSU 1220 OR 1	1.00	8
05132025-6	PLL DR SENSOR DSU 72-95VD	1.00	38-A1
44330002	SCW CAP HEXHD 1/4-20X3/4	4.00	25FORT1
44620001	WSHR,LK SPLIT 1/4	4.00	20FORT1
44700007	WSHR,FLAT 1/4	4.00	29FORT1

BOM 05132009 PANEL,FRONT DSU 1000-1800 REVISION: A

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129258	PANEL, FRONT DSU 1000/180	.00	'
05129259-1	PNL,FRONT DSU 1000/1800 L	1.00	8
44300014	PHMS PHH 6-32X3/8	6.00	40
44320006	MSCR FLH PHH 10-24X3/8	4.00	38
50313001	INDICATOR LED RED 5VDC	1.00	35-DS2
50313002	LED GREEN	1.00	36-DS4
50313004	INDICATOR LED YELLOW 5VDC	2.00	34-DS1,DS3
50501010	BEZEL, METER MTG	2.00	16FORM3&M4
51901002	1654 EQUIPMENT HANDLES	2.00	32
55300008	SW DP DT ROCKER PNL MT RE	1.00	37-S1

BOM 05132009-1 PANEL,FRONT DSU 1022 OR 1024 REVISION: A

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05132009	PANEL,FRONT DSU 1000-1800	1.00	'
50501015	METER 0-10 AAC	1.00	14-M3
50501040	VOLTMETER 0-300 VAC	1.00	15-M4
55601136	CB 2P 30A 120-240-2 CD2	1.00	2-CB1
55601149	CB IP 30A 125V W/SHT TRIP	1.00	1-CB3

BOM 05132009-2 PANEL,FRONT DSU 1220 OR 1221 REVISION: A

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05132009	PANEL,FRONT DSU 1000-1800	1.00	BASIC
50501009	METER 0-150 VAC	1.00	15-M4
50501011	METER 0-25AAC	1.00	14-M3
55601136	CB 2P 30A 120-240-2 CD2	1.00	'
55601149	CB IP 30A 125V W/SHT TRIP	1.00	1-CB3

BOM 05132009-3 PANEL,FRONT DSU 1522 OR 1524 REVISION: A

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05132009	PANEL,FRONT DSU 1000-1800	1.00	BASIC
50501015	METER 0-10 AAC	1.00	14-M3
50501040	VOLTMETER 0-300 VAC	1.00	15-M4
55601137	CB 2P 40A 120-240-2 C	1.00	2-CB1
55601150	CB 1P 50A 125V W/SHT TRIP	1.00	1-CB3

BOM 05132009-4 PANEL,FRONT DSU 1820 OR 1821 REVISION: A

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05132009	PANEL,FRONT DSU 1000-1800	1.00	BASIC
50501009	METER 0-150 VAC	1.00	15-M4
50501011	METER 0-25AAC	1.00	14-M3
55601137	CB 2P 40A 120-240-2 C	1.00	2-CB1
55601150	CB 1P 50A 125V W/SHT TRIP	1.00	1-CB3

BOM 05132010 PWR/SEMICOND HT/SK 1000-1800 REVISION: B

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05129254	DET BRKT, HEATSINK	2.00	2
05129605	HEATSINK MODULE	1.00	1
05130323	PWR/SEMICOND HT/SK 1000-1	.00	'
38710105	DIODE RECT 1N2135	2.00	12CR3,4
38710143	DIODE RECT 85HF40	2.00	13 CR1,2
38800005	SCR 2N1979/C52C/NLC52C	2.00	14Q1,2
38800019	SCR NLF157D	2.00	15Q3,4
42700000	NETWORK R/C .25MFD 470OHM	2.00	20-Z1,3
42700001	NETWORK R/C .1MFD 470OHM	2.00	21Z2,4
44300004	PHMS PHH 6-32X1/2"	4.00	3FOR2
44300024	PHMS PHH 10-32X1/2	2.00	26
44500004	NUT HEX 6-32	4.00	5FOR2
44500006	NUT HEX 10-32	2.00	27
44600006	WSHR,LK,INTL TOOTH #10	2.00	28
44620003	WSHR,LK SPLIT #6	4.00	4FOR2
48800017	TERM,RING,CRIMP,18-22GA,#	2.00	25
48800070	TERM,RING,CRIMP,18-22GA,1	2.00	24
53601002	WAKEFIELD EPOXY 152-Q	.00	18FORTS1&TS2
53601008	HEATSINK COMPOUND NOALOX	.00	10FORCR&SCR
55303009	SW TEMP N.O. CLOSE AT 180	1.00	16TS-1
55303010	SW TEMP N.O. CLOSE AT 240	1.00	17TS-2
60411004	#18 NATURAL TEFLON SLEEVI	.00	23

ONE BOM PART NUM SEQUENCE

BOM 05132011 HARNESS DSU 1000-1800 REVISION: B

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05132005	W/L DSU 1000-1800	.00	'
05132012	BRIDGE PROTEC/STATUS NETW	1.00	100-TB44
05132018	MODULE, MOTHER BD	1.00	101
31100003	RES 4TERM .004OHM 12W ALU	1.00	R3
33155801	RES WW 800 OHM 50W	1.00	R2
38720020	DIODE AXLD 1N4003G	2.00	CR8,6
45610006	WIRE STRAP,NYLON, .143 (M	.00	'
45610010	WIRE STRAP, NYLON,.100 (S	.00	'
45610011	WIRE STRAP, NYLON,.183 (L	.00	'
48301005-9	PLUG, WHITE	1.00	A4-P1
48312008	CONN 6-16GA 2P 50A 6	1.00	J3
48500067	TB 30A 2T SCRW # 6	1.00	TB33
48510007	TERMINAL STRIP	1.00	TB7
48800017	TERM,RING,CRIMP,18-22GA,#	1.00	FORCB3
48801006	TERM,RING,CRIMP, 7-9GA,1	4.00	'
48805016	SLIP-ON F 18-22GA @.032X.	.00	FORTB11
57100308	RELAY SPDT 10A 120VAC 6L/	2.00	K1,K6
57100309	RELAY SPDT 24VDC 10A	1.00	K2
60081204	WIRE 12GA UL3317 IRD PVC	142.00	'
60081804	WIRE 18GA UL1430 IRD PVC	8.00	'
60082204	WIRE 22GA UL1430 IRD PVC	216.00	'
60121409	WIRE 14GA UL1431 IRD PVC	1.00	'
60423005	WIRE 22GA 2COND VINYL CAB	12.00	'

BOM 05132012 BRIDGE PROTEC/STATUS NETWORK REVISION: C

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05132013	ASY BRIDGE PROT/STAT NETW	.00	'
05132014	SCH BRIDGE PROT/STAT NETW	.00	'
33260000	MOV 130VRMS 10 JOULE	1.00	1-RV1
35102008	CAP FILM 10UF 135V	1.00	3-C10
35102010	CAP FILM 1.0UF 120VRM MN	1.00	6-C44
37104001	CAP CER .1MF 500V	1.00	5-C7
38720020	DIODE AXLD 1N4003G	1.00	4-CR44
45610006	WIRE STRAP,NYLON, .143 (M	.00	7
48510003	3007 TERMINAL STRIP	1.00	1-TB44
60082204	WIRE 22GA UL1430 IRD PVC	4.00	'
60122200	WIRE 22GA UL1431 IRD PVC	4.00	'
60212200	WIRE 22AWG SOLID BUSS	.00	'
60411004	#18 NATURAL TEFLON SLEEVI	.00	'

ONE BOM PART NUM SEQUENCE

BOM 05132018 MODULE, MOTHER BD 5/6 REVISION: A

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05122871	XFMR	1.00	T6
05124355	SNUBBER/FILTER DSU 500-1	1.00	A3
05129927	BRACKET MTG MOTHER BOARD	1.00	5
05131961	BRKT,MTG,PC	1.00	90
05132019	ASY MODULE, MOTHER BD	.00	'
30154102	RES C 1K 2W 5%	2.00	R5,R6
30154472	RES C 4.7K 2W 5%	3.00	R18,19,20
30154682	RES C 6.8K 2W 5%	1.00	R17
33155451	RES WW 450 OHM 50W	1.00	R10
35102005	CAP FILM .22UF 220V 20%	1.00	C6AFOR50HZ
35102015	CAP METMYL .82 MF 400VDC	2.00	C5(C6BFOR60HZ)
44300001	PHMS PHH 4-40X3/8	6.00	31
44300004	PHMS PHH 6-32X1/2"	4.00	78FORA4
44300014	PHMS PHH 6-32X3/8	9.00	22
44600003	WSHR,LK,INTL TOOTH #4	6.00	59
44620003	WSHR,LK SPLIT #6	5.00	50
44700004	WSHR,FLAT #6	8.00	42
45700005	SPCR,PLSTC,#6, 1/4 OD X 3	4.00	14
48100012	CONN 22 PIN SOLDER LUG W/	2.00	A1-J2,A2-J6
48510001	CJ 54B TERMINAL STRIP	4.00	TB5,6,8,9

BOM 05132025 PLL DR SENSOR REVISION: F

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05128970	SPEC TEST PROCEEDURE PLL	.00	'
05132026	ASY PLL DR SENSOR	.00	'
05132027	SCH PLL DR SENSOR	.00	'
05132028	PCB PLL DR SENSOR	1.00	9
30151100	RES C 10 OHMS 1/4W 5%	1.00	R33
30151101	RES C 100 OHM 1/4W 5%	6.00	R21,22R42,43R68,67
30151102	RES C 1K 1/4W 5%	4.00	R15,18R9,12
30151103	RES C 10K 1/4W 5%	5.00	R4,7,8R46,47
30151104	RES C 100K 1/4W 5%	3.00	R19,28,40
30151124	RES C 120K 1/4W 5%	1.00	R29
30151153	RES C 15K 1/4W 5%	1.00	R1
30151155	RES C 1.5 MEG 1/4W 5%	2.00	R39,R2
30151183	RES C 18K 1/4W 5%	1.00	R3
30151222	RES C 2.2K 1/4W 5%	3.00	R20,41,61
30151225	RES C 2.2 MEG 1/4W 5%	1.00	R45
30151274	RES C 270K 1/4W 5%	2.00	R60,R55
30151331	RES C 330 OHM 1/4W 5%	1.00	R69
30151332	RES C 3.3K 1/4W 5%	1.00	R14
30151333	RES C 33K 1/4W 5%	1.00	R70
30151471	RES C 470 OHM 1/4W 5%	4.00	R10,11,23R32
30151472	RES C 4.7K 1/4W 5%	4.00	R13R44,5,6,
30151474	RES C 470K 1/4W 5%	2.00	R38,66
30151475	RES C 4.7 MEG 1/4W 5%	2.00	R48,R37
30151511	RES C 510 OHM 1/4W 5%	1.00	R62
30151681	RES C 680 OHM 1/4W 5%	1.00	R24
32301001	RES MF 1.00K 1/4W 1%	2.00	R26,R30
32301002	RES MF 10.0K 1/4W 1%	2.00	R25,R27
32302551	RES MF 2.55K 1/4W 1%	2.00	R57,51
32303832	RES MF 38.3K 1/4W 1%	1.00	R49
32304991	RES MF 4.99K 1/4W 1%	1.00	R59
33158005	RES WW 47 OHM 2W 5%	2.00	R16,17
33252028	RES WW 3K 5W	1.00	R50
33290223	SEN 22K 10% 1/8W PTC RESI	1.00	R-100
34201202	RES VAR 2K CERMET	2.00	R58,R31
34201203	RES VAR 20K CERMET	1.00	R35
34201503	RES VAR 50K CERMET	1.00	R101
35100104	CAP METMYL .1MF 50V MIN	1.00	C15
35100105	CAP METMYL 1UF 50V MIN 10	2.00	C11,14
35102001	CAP FILM .1UF 100V 5%	1.00	C13
36102003	CAP ALEC 10MF 63V	1.00	C19
36103001	CAP ALEC 10MF 150V	1.00	C7
36106001	CAP ALEC 47MFD 35V -10TO+	1.00	C24
36601000	CAP SOLTA 2.2MFD 35V	6.00	C1,5,8,9,12,25
36601002	CAP SOLTA 10UF 20V	3.00	C10,17,3
37100000	CAP CER .001MF 1000V	1.00	C4
37100003	CAP CER .01UF 500V	1.00	C6
37101000	CAP CER .1MF 12V MIN	2.00	C16,20
37103000	CAP CER .05MF 100V	2.00	C22,23
37103001	CAP CER .01UF 100V	2.00	C2,18
38640030	XSTR 2N2222A	1.00	Q9
38640040	XSTR 2N2907A	4.00	Q1-3,Q10
38640130	XSTR 2N3439	2.00	Q4,5
38640231	XSTR KE4393/PN4393	3.00	Q6-8

BOM 05132025 PLL DR SENSOR REVISION: F

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
38640241	XSTR 2N5682	1.00	Q12
38640247	XSTR NPN DARLINGTON TIP	1.00	Q13
38720010	DIODE AXLD 1N4148	5.00	CR19,20CR2,13,14
38720020	DIODE AXLD 1N4003G	6.00	CR22,23CR3-5,15
38910010	DIODE ZNR 1N750	2.00	CR6,17
38910021	DIODE ZNR 1N754A	2.00	CR18,21
38910090	DIODE ZNR 1N5245B	2.00	CR7,16
38910091	DIODE ZNR IN748	1.00	CR25
38920001	DIODE ZNR 1W 1N4747A	1.00	CR1
40600001	IC DGTL 741 DIP OP AMP	6.00	U11U6-9,12
40610012	IC DUAL JK FLIP-FLOP 402	1.00	U4
40610013	IC PHASE LOCKED LOOP 404	1.00	U10
40611007	IC QUAD 2 NOR CD400	1.00	U3
40611008	IC QUAD 2IN NAND 401	1.00	U5
40620006	IC REGULATOR +12 LM340T	1.00	U1
40640001	IC OPT ISOLR MCT-2	2.00	U13,14
40660004	IC TIMER PLASTIC DIP NE5	1.00	U2
45900006	COMPONENT MOUNT .500	6.00	12FORR15-19&R40
45900010	SOCKET PLASTIC DIP 16PIN	1.00	FOR U10
48910001	BB TERMINALS, TURRET	2.00	TP1,TP2
71100004	SPACER INS, TR-PAD TO-5	3.00	,Q5,Q1211FORQ4

BOM 05132025-5 PLL DR SENSOR DSU 72-95VDC 5 REVISION: F

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05132025	PLL DR SENSOR	1.00	BASIC
05132032	SPEC.RES.,FACTORY SELECT	1.00	R34
OV COST	OUT SIDE VENDOR COST	5.39	

BOM 05132025-6 PLL DR SENSOR DSU 72-95VDC 6 REVISION: F

PART NUMBER	DESCRIPTION	QTY EACH	REFERENCE DESIGNATOR(S)
05132025	PLL DR SENSOR	1.00	BASIC
05132032	SPEC.RES.,FACTORY SELECT	1.00	R34
OV COST	OUT SIDE VENDOR COST	7.40	

XI. ASSEMBLY DRAWINGS

The following assembly drawings comprise Section XI of this manual and are presented in numerical order as shown.

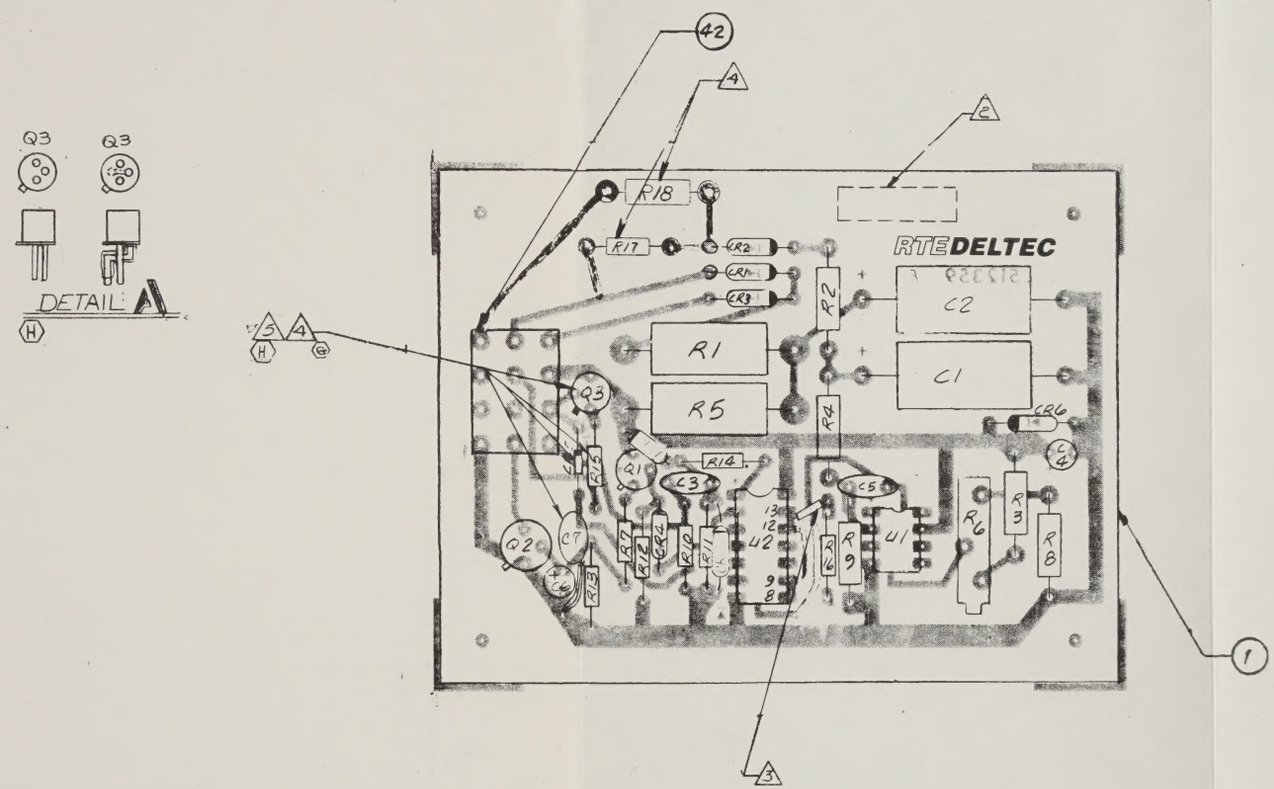
Part Number	Title
05123596	AC Sensor & Relay Driver
05124356	Snubber/Filter DSU 500-1800
05129258	Panel Front DSU 1000-1800VA
05129827	Battery Charger Control 1 Phase
05130323	Power/Heat Sink DSU 1000-1800VA
05130355	Panel Rear DSU 1000-1800VA
05131993	DSU 1000-1800VA
05132013	Bridge Protec/Status Network
05132019	Modules, Mother Board
05132026	PLL Driver Sensor

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	E	REDRAWN PER ECO 1651	7-18-75	
	F	PER ECO 3548	6/12/78	
	G	PER ECO 4241 (G)	4/8/80	
	G1	PER ECO 4588/TITLE	9-25-80	
	H	PER EO 6267 ADDED DETAILS 1 & 2	6-17-81	
	H1	EO 6908 MADE CRT & CRB MORE READABLE.	10-13-81	
	J	PER E.O. 9173	5-12-83	S-9-3
	J2	EO 10985 INC EO 9402	4-2-85	3-12-85

1

REFERENCE	DRAWING	DESCRIPTION
DRAWN 3/3/77	RTE DELTEC SAN DIEGO, CALIFORNIA	
CHECKED 3/10/77	TITLE AC SENS/RELAY DR PC ASY.	
APPROVED Rodney, Ct Gaudion		
RELEASED 4/5/77	SIZE C / TYPE 520 / NUMBER 05123596	REV J
QA 3/21/77	PRODUCT DSU's / DI's	NEXT ASSY

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	E	REDRAWN PER ECO 1651	7-8-75	
	F	PER ECO 3548	6/12/76	
	G	PER ECO 4241 (G)	1/8/79	
	G1	PER ECO 4588/TITLE	9-25-80	
	H	PER EO 6267 ADDED DETAIL A & C-7	6-17-81	
	H1	EO 6908 MADE CR7 & CR8 MORE REPLACABLE.	10-13-81	
	J	PER E.O. 9173	5-12-83	5-9-83
	J2	EO 10985 INC EO 9402	4-2-85	5-17-85



6. DELETED

(H)(5) PREP TRANSISTOR Q3 AS SHOWN IN DETAIL A BEFORE INSERTION

(4) DASH CONFIGURATIONS (SEE TABLE).

(3) JUMPER AS SHOWN (1 PLC).

(2) MARK 05123595, DASH NO., & REV. LTR, APPROX. WHERE SHOWN.

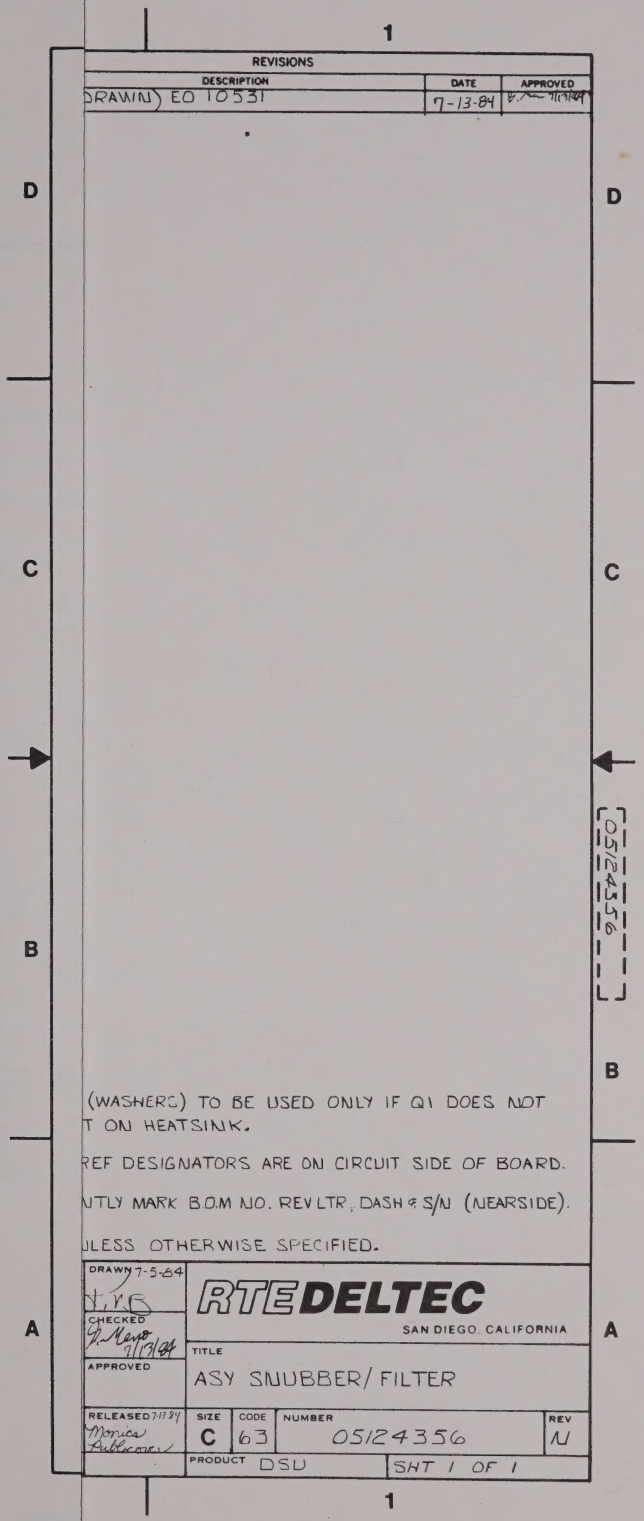
NOTES:

(4)

DASH NO.	COMPONENT VARIATION	APPLICATION
-1	CR5, Q3, R15, & R18, C7 NOT USED	120 VAC OUTPUT W/O LED DRIVE
-2	R18 NOT USED	120 VAC OUT PUT W/LED DRIVE
-3	R17 NOT USED	220 OR 240 VAC OUTPUT W/LED DR.

FIND	QTY	REFERENCE	DRAWING	DESCRIPTION
TOLERANCES XXX: ±0.010 XX: ±.03 X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED		DRAWN	RTE DELTEC SAN DIEGO, CALIFORNIA	
		CHECKED	TITLE AC SENS/RELAY DR PC ASY	
		APPROVED		
DO NOT SCALE THIS DRAWING		RELEASED	SIZE C	TYPE 520
SCALE 2:1		QA	PRODUCT DSU's / DI's	NEXT ASSY

NUMBER 05123596 REV J



REVISIONS

DESCRIPTION	DATE	APPROVED
DRAWN) EO 10531	7-13-84	

(WASHERS) TO BE USED ONLY IF Q1 DOES NOT
T ON HEATSINK.

REF DESIGNATORS ARE ON CIRCUIT SIDE OF BOARD.

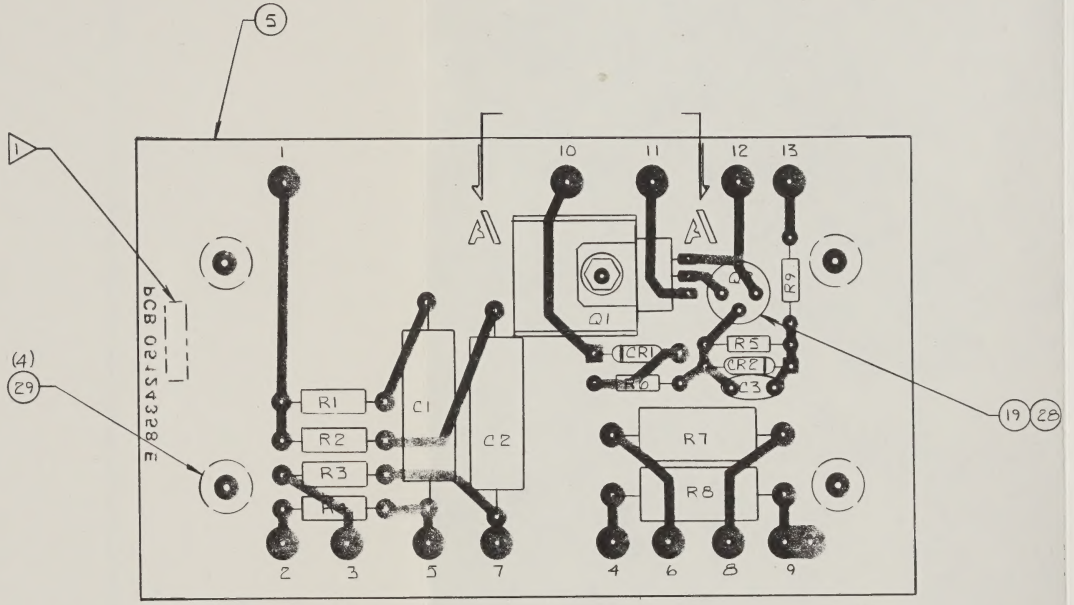
NTLY MARK B.O.M NO. REV LTR, DASH # S/N (NEARSIDE).

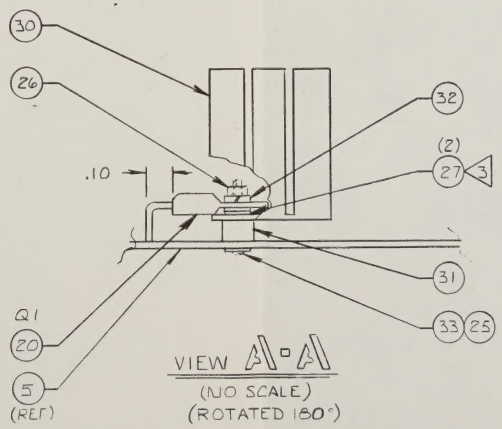
ULESS OTHERWISE SPECIFIED.

DRAWN 7-5-84	RTE DELTEC SAN DIEGO, CALIFORNIA				
CHECKED	TITLE: ASY SNUBBER/ FILTER				
APPROVED					
RELEASED 7-17-84 Monica Pellicone	SIZE C	CODE 63	NUMBER 05124356	REV N	
	PRODUCT DSU	SHT 1 OF 1			

05124356

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	N	(REDRAWN) EO 10531	7-13-84	





VIEW A1-A1
(NO SCALE)
(ROTATED 180°)

3. ITEM 27 (WASHERS) TO BE USED ONLY IF Q1 DOES NOT SIT FLAT ON HEATSINK.

2. ETCH & REF DESIGNATORS ARE ON CIRCUIT SIDE OF BOARD.

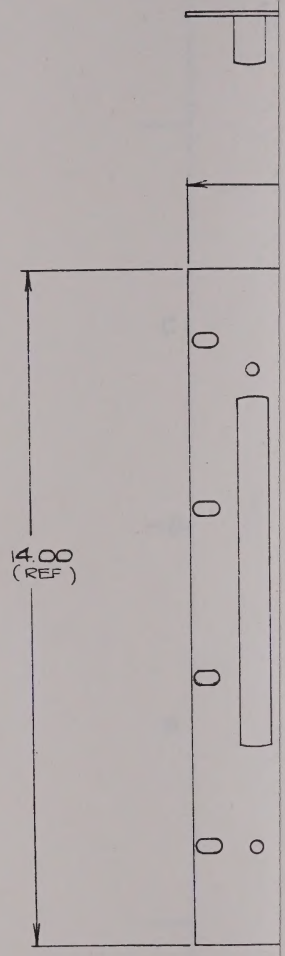
1. PERMANENTLY MARK B.O.M NO. REV LTR, DASH & S/N (NEARSIDE).

NOTES: UNLESS OTHERWISE SPECIFIED.

TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN 7-5-84	RTE DELTEC SAN DIEGO, CALIFORNIA			
	CHECKED	TITLE ASY SNUBBER/FILTER			
	APPROVED				
DO NOT SCALE THIS DRAWING	RELEASED 7/13/84 Monica Fullerton	SIZE C	CODE 63	NUMBER 05124356	REV N
SCALE 2:1		PRODUCT DSU		SHT 1 OF 1	

05124356

REVISIONS		
PTION	DATE	APPROVED
	7/11/80	
554 ADD MTR. ADJ. HOLES	8/31/80	
	1-23-81	



DESCRIPTION

DELTEC

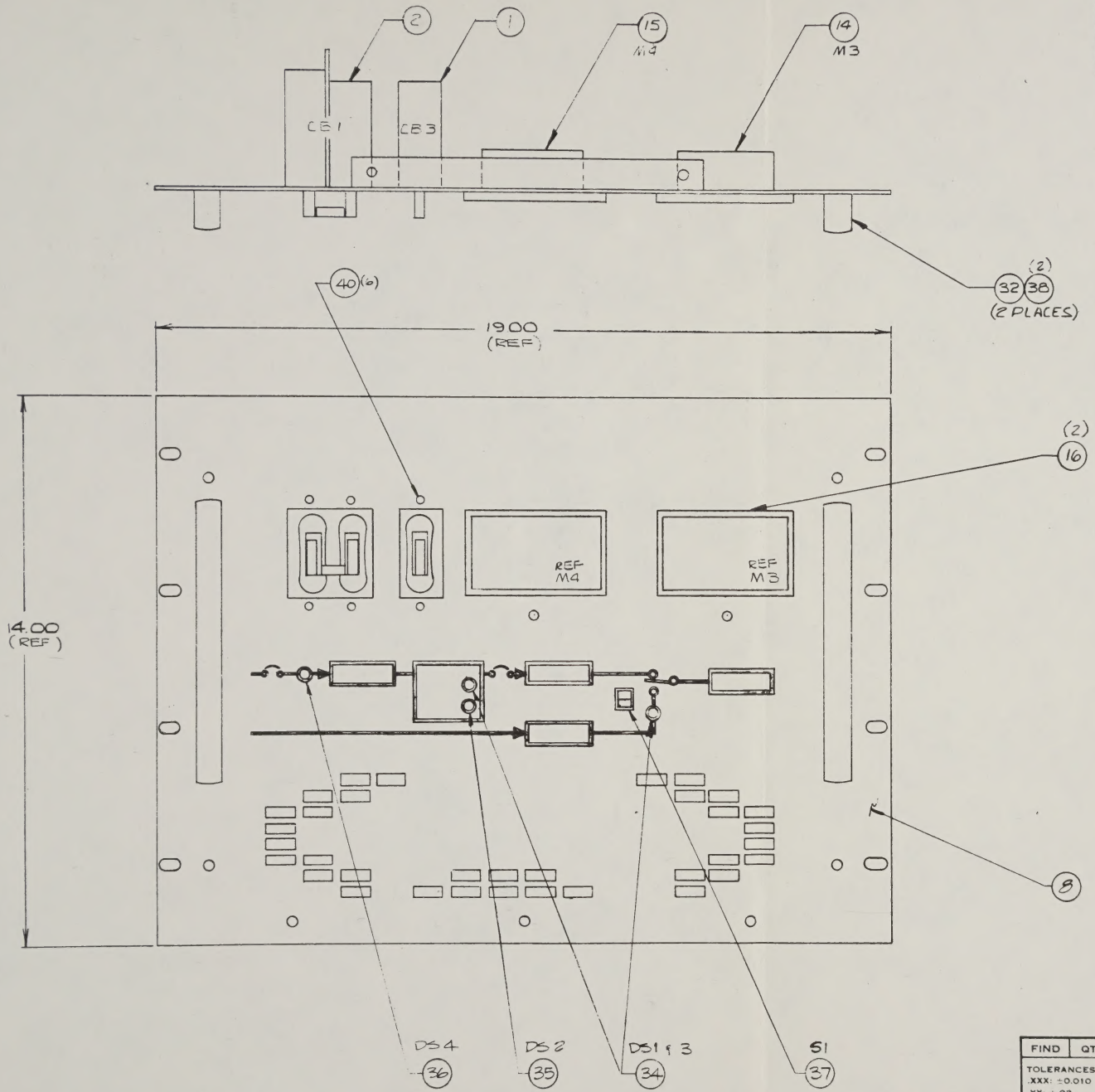
SAN DIEGO, CALIFORNIA

NEL, FRONT
000/1800

NUMBER	REV
05129258	C

1000-1800 | NEXT ASSY

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PROD RELEASE	7/11/80	
	B	PER ECO 4554 ADD MTR. ADJ. HOLES	7/31/80	
	C	PER ECO 4...	1-23-81	



FIND	QTY	REFERENCE	DRAWING	DESCRIPTION
TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED		DRAWN 2-8-80	RTE DELTEC SAN DIEGO, CALIFORNIA	
		CHECKED 7/30	TITLE PANEL, FRONT DSU 1000/1800	
		APPROVED 7/30/80		
DO NOT SCALE THIS DRAWING		RELEASED 7/3/80	SIZE C TYPE ASY NUMBER 05129258	REV C
SCALE NONE		QA	PRODUCT DSU 1000-1800	NEXT ASSY

REVISIONS			
	DESCRIPTION	DATE	APPROVED
	PRODUCTION RELEASE	12-15-80	[illegible]
	PER EO 6117 ADD REF DES. FOR TP9, TP2 WAS TP7		[illegible]
	PER EO 6260 ADD R81 & Q10	7-16-81	[illegible]
	PER EO 6502 ADDED C26, C27 MOVED R18 ROTATED Q10	7-30-81	[illegible]
	PER EO 6736 ADDED ALTERNATE ASY FOR -212 ONLY.	9-2-81	[illegible]
E	PER EO 7179	12-21-81	[illegible]
F	PER EO 8923 ADDED TP3 ALTERNATE FOR -212	3/8/83	[illegible]
F1	PER EO 8923 A CORRECTED NOTE 4, DETAIL B AND VIEW B-B	3/10/83	[illegible]
G	PER EO 11494 DEL: C25, C27 CHG: C28, C29	2-13-86	[illegible] 2-11-86

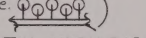
(F)

1

05129827

4 ROTATE S1 AS SHOWN IN DETAIL "13". REMOVE CONVERSION BD & INSTALL UPRIGHT AS SHOWN IN VIEW "13-13"

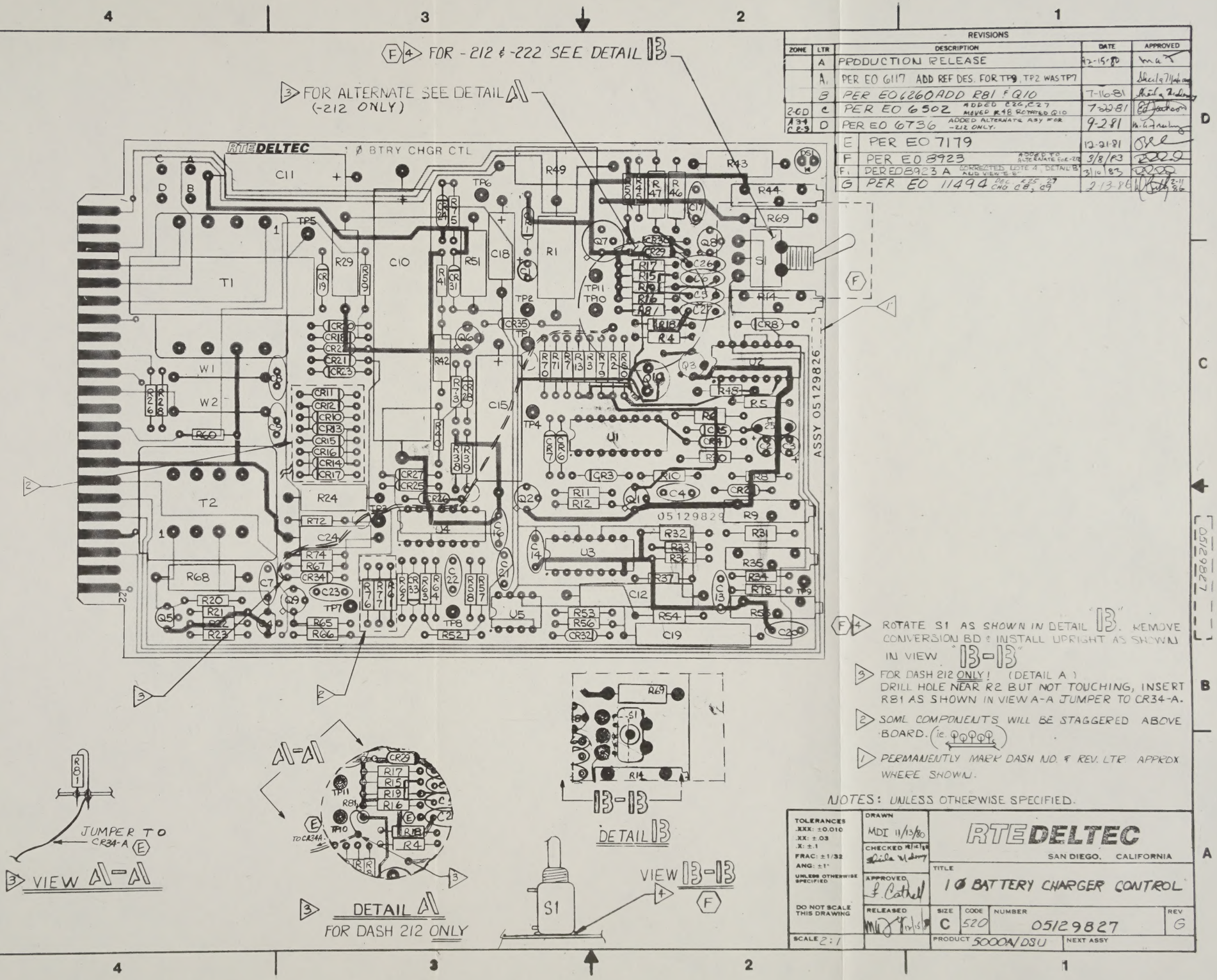
3 FOR DASH 212 ONLY! (DETAIL A) DRILL HOLE NEAR R2 BUT NOT TOUCHING, INSERT R81 AS SHOWN IN VIEW A-A JUMPER TO CR34-A.

2 SOML COMPONENTS WILL BE STAGGERED ABOVE BOARD. (ie. )

1 PERMANENTLY MARK DASH NO. & REV. LTR. APPROX WHERE SHOWN.

NOTES: UNLESS OTHERWISE SPECIFIED.

DRAWN	MDI 11/13/80	RTE DELTEC SAN DIEGO, CALIFORNIA
CHECKED	[illegible] 12/12/80	
APPROVED	L. Cathell	TITLE: 10 BATTERY CHARGER CONTROL
RELEASED	[illegible] 12/15/80	SIZE C · CODE 520 · NUMBER 05129827 · REV G
		PRODUCT 5000A/DSU · NEXT ASSY



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PRODUCTION RELEASE	12-15-80	
	A1	PER EO 6117 ADD REF DES. FOR TP3, TP2 WAS TP1		
	B	PER EO 6260 ADD R81 & Q10	7-16-81	
2-CD	C	PER EO 6502 ADDED C26, C27 MOVED R48 ROTATED Q10	7-29-81	
A3-4 C2-3	D	PER EO 6736 ADDED ALTERNATE ASY FOR -212 ONLY.	9-2-81	
	E	PER EO 7179	12-21-81	
	F	PER EO 8923 ADDED TO ALTERNATE FOR -212	3/8/83	
	F1	PER EO 8923 A CORRECTED NOTE 4, DETAIL B AND VIEW B-B	3/16/83	
	G	PER EO 11494 DEL C25, 27 CNG C8, 29	2-13-86	2-11-86

(F)4 ROTATE S1 AS SHOWN IN DETAIL 13. REMOVE CONVERSION BD & INSTALL UPRIGHT AS SHOWN IN VIEW 13-13

3 FOR DASH 212 ONLY! (DETAIL A) DRILL HOLE NEAR R2 BUT NOT TOUCHING, INSERT R81 AS SHOWN IN VIEW A-A JUMPER TO CR34-A.

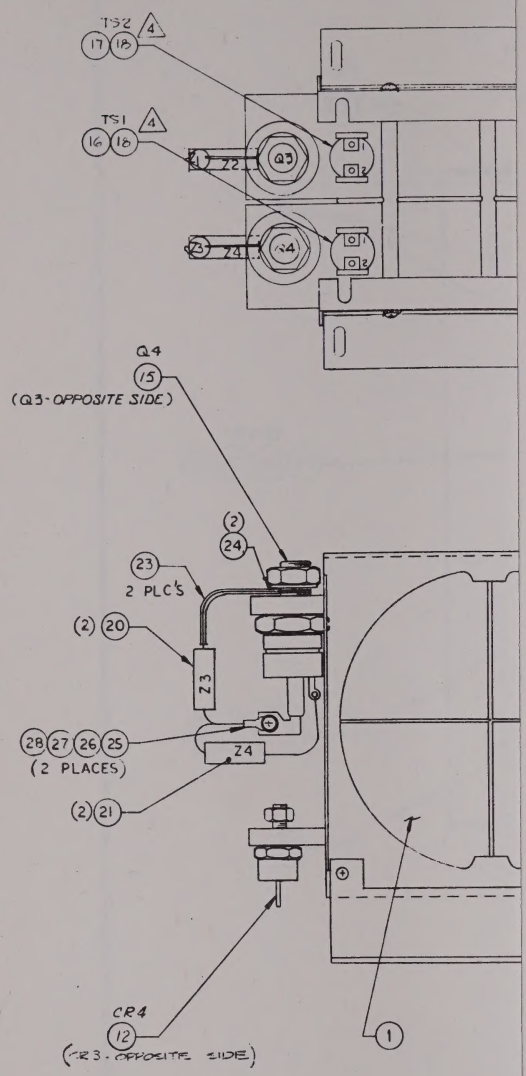
2 SOME COMPONENTS WILL BE STAGGERED ABOVE BOARD. (ie. ⏚⏚⏚⏚)

1 PERMANENTLY MARK DASH NO. & REV. LTR. APPROX WHERE SHOWN.

NOTES: UNLESS OTHERWISE SPECIFIED.

TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN MDI 11/13/80	RTE DELTEC SAN DIEGO, CALIFORNIA	
	CHECKED	TITLE 1Ø BATTERY CHARGER CONTROL	
	APPROVED L. Cathell		
DO NOT SCALE THIS DRAWING	RELEASED	SIZE C	CODE 520
SCALE 2:1		PRODUCT 5000A/DSU	NEXT ASSY

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PROD RELEASE	3-11-81	
	B	PER EO 6555 AND NOTE "2,5	8-3-81	
	C	PER EO 7335 CHANGE TSI, TS2 MOUNTING HOLES & ADD NOTE	1-1982	
	D	PER EO 7745 ADD SHRINKAGE	9/25/82	
	E	PER EO 7940 ADD LUG TO GROUNDING	6/3/82	



6 FOR WIRING DETAILS SEE SYSTEM W/L.

5 DELETED

4 USE EPOXY (18) TO FASTEN TEMPERATURE SENSOR TO HEATSINK. BEND TABS UPWARD AT 90° ANGLE.

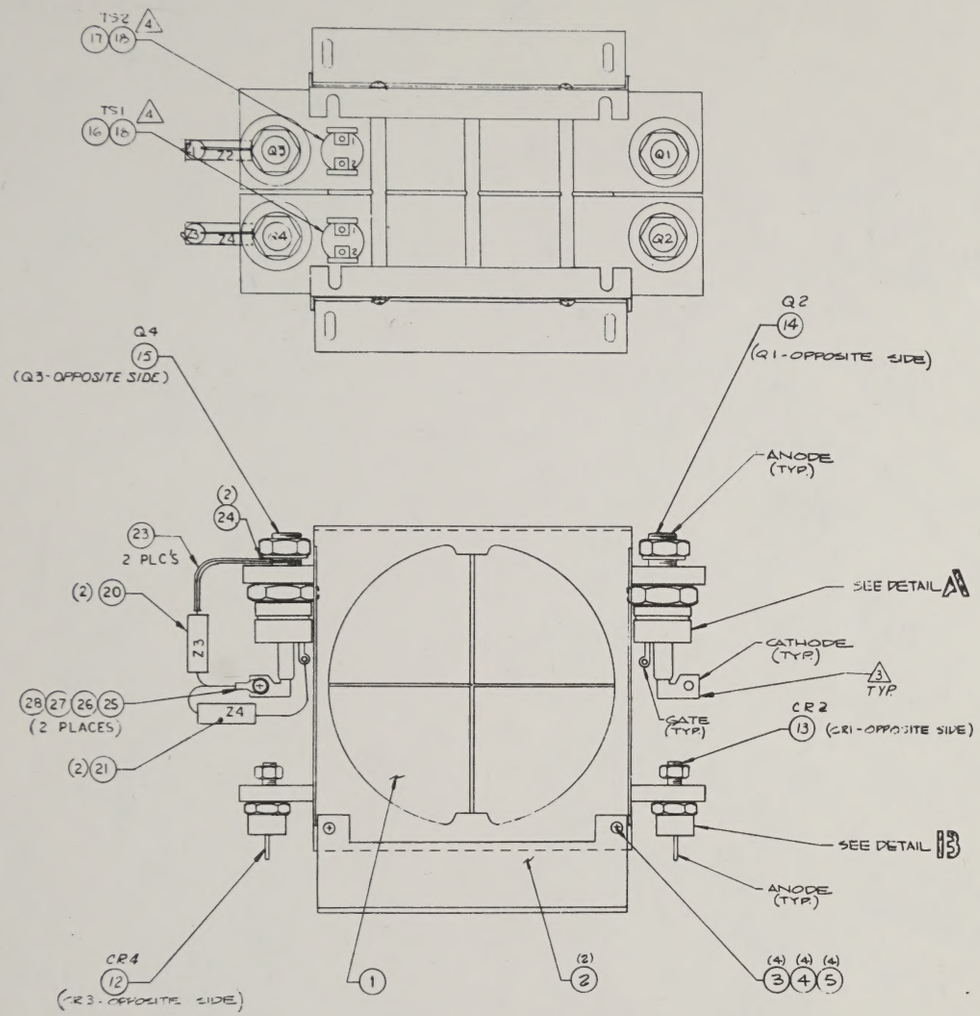
3 CAUTION COMPONENT LEADS & LUGS MUST NOT COME IN CONTACT WITH THE HEATSINK AND OTHER METAL OBJECTS.

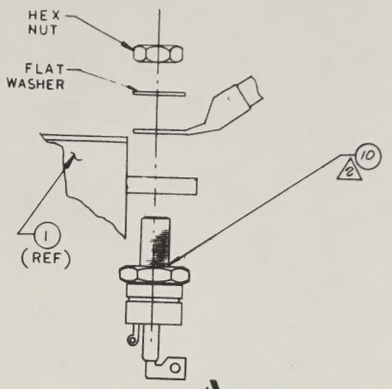
2 APPLY THIN COAT (.001") OF HEATSINK COMPOUND (10) TO MOUNTING SURFACES OF ALL CR'S & SCR'S EXCEPT CR5

1. TORQUE CR1 THRU CR5 25-35 IN-LB & Q1 THRU Q4 TO 125-150 IN-LB PER QCI 203001, Pg 6.

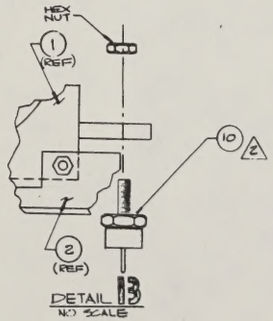
NOTES:

FIND	QTY	REFERENCE	DRAWING	DESCRIPTION
TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED		DRAWN 1-20-81 B.G.	RTE DELTEC SAN DIEGO, CALIFORNIA	
		CHECKED 2-17-81 M.A. Rueberry	TITLE POWER/SEMICONDUCTOR HEATSINK ASY	
		APPROVED [illegible] 7/9/81		
DO NOT SCALE THIS DRAWING		RELEASED 8-10-81	SIZE D / TYPE 63 / NUMBER 05130323	REV E
SCALE NONE		QA	PRODUCT BSU 1600-1800	NEXT ASSY





DETAIL A
NO SCALE



DETAIL B
NO SCALE

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PROD RELEASE	3-11-81	
	B	PER EO6555 CHG NOTE 2,5 & ADD NOTE 11	8-3-81	
	C	PER EO 7335 CHANGE TAB BEND DIRECTION & NOTE	1-19-82	
	D	PER EO 7745 NOT RELEASED	4/21/92	
	E	PER EO 7940 ADD LWS TO DRAWING	6/3/92	

6 FOR WIRING DETAILS SEE SYSTEM W/L.

5 DELETED

4 USE EPOXY (18) TO FASTEN TEMPERATURE SEUSOR TO HEATSINK. BEND TABS UPWARD AT 90° ANGLE.

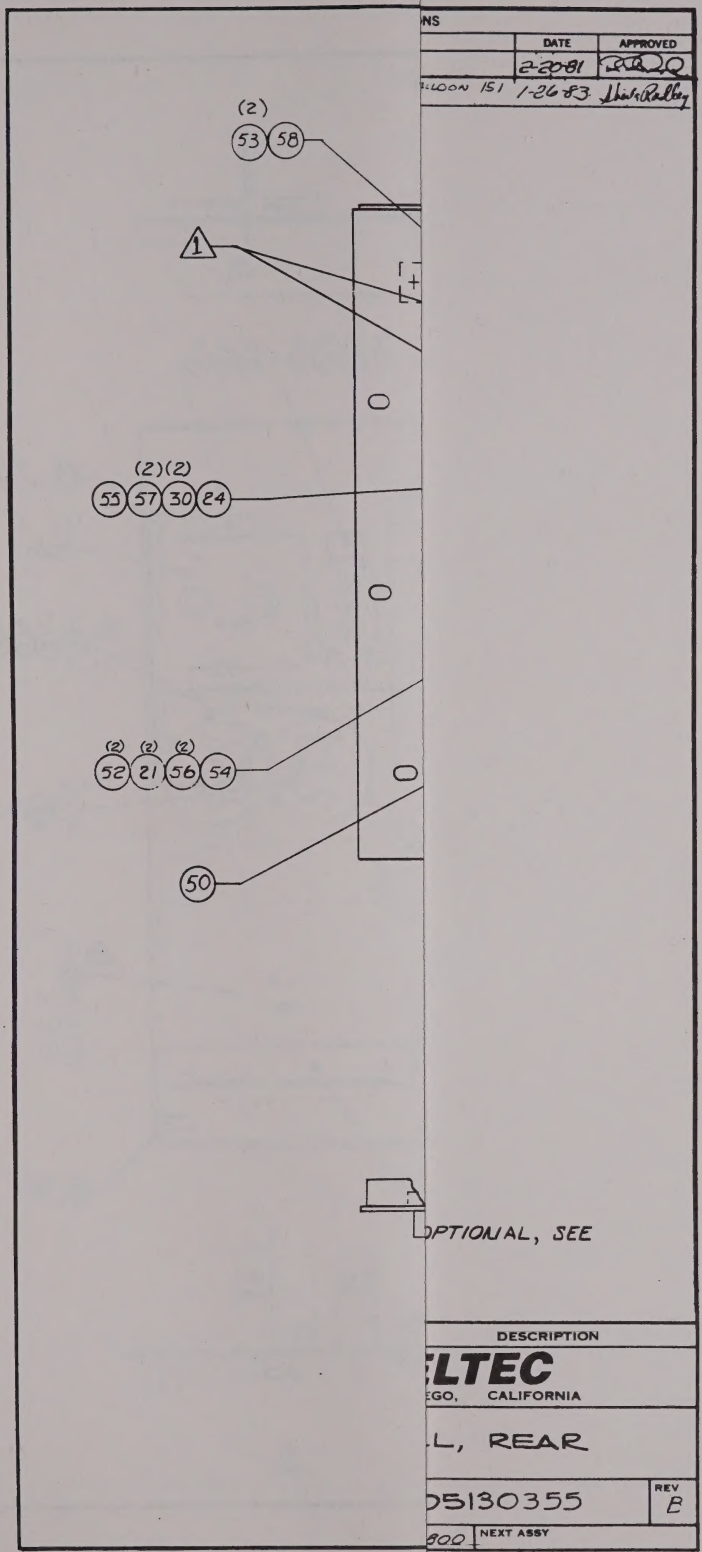
3 CAUTION COMPONENT LEADS & LUGS MUST NOT COME IN CONTACT WITH THE HEATSINK AND OTHER METAL OBJECTS.

2 APPLY THIN COAT (.001") OF HEATSINK COMPOUND (10) TO MOUNTING SURFACES OF ALL CR'S & SCR'S EXCEPT CR5.

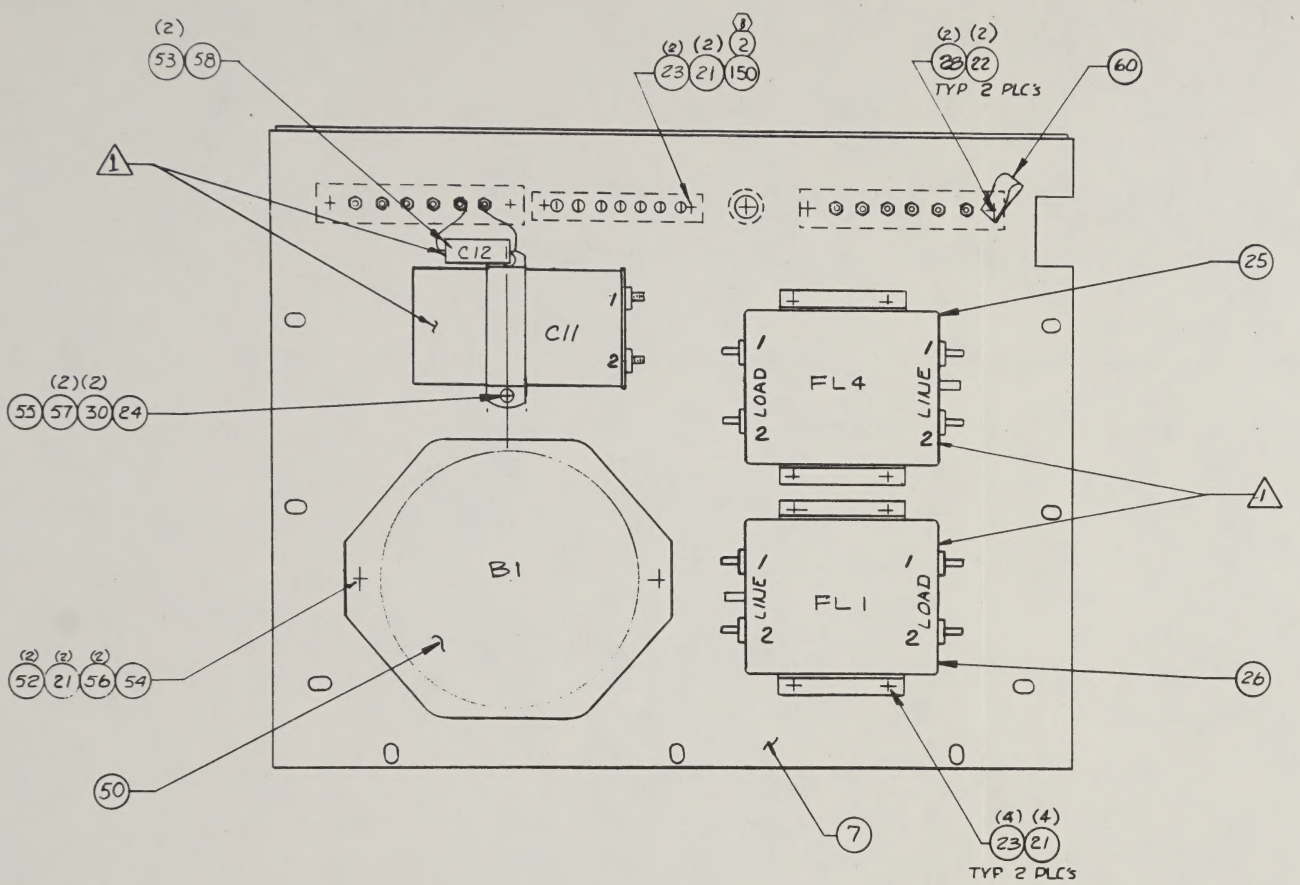
1. TORQUE CR1 THRU CR5 25-35 IN-LB & Q1 THRU Q4 TO 125-150 IN-LB PER QCI 203001, Pg6.

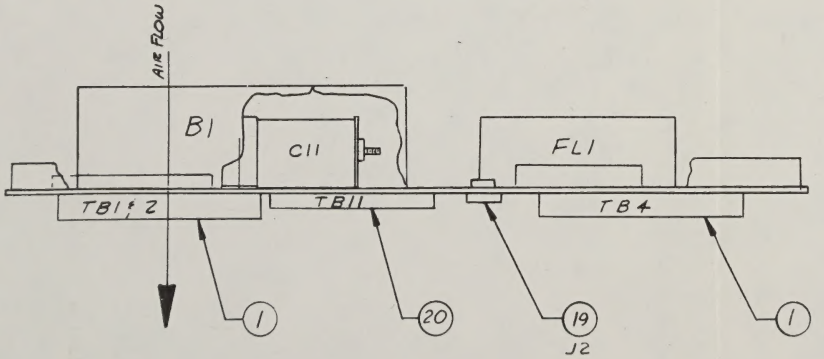
NOTES:

FIND	QTY	REFERENCE	DRAWING	DESCRIPTION
TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED		DRAWN 1-20-81 B.O.	RTE DELTEC SAN DIEGO, CALIFORNIA	
		CHECKED 2-17-81 M.A. Pearlman	TITLE POWER/SEMICONDUCTOR HEATSINK ASY	
DO NOT SCALE THIS DRAWING		APPROVED 2-17-81		
		RELEASED 3-10-81	SIZE D TYPE 63 NUMBER 05130323 REV E	
SCALE NONE		Q.A.	PRODUCT PSU 1000-1800 NEXT ASSY	


NS
DATE
APPROVED
2-20-81
LOON 151 1-26-83
(2)
53 58
1
(2)(2)
55 57 30 24
(2) (2) (2)
52 21 56 54
50
OPTIONAL, SEE
DESCRIPTION
ELTEC
EGO, CALIFORNIA
L, REAR
05130355
REV
B
800
NEXT ASSY

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PROD. RELEASE	2-20-81	
	B	PER EO 8849 ADD BALLOON 151	1-26-83	





⚠1 SOME REFERENCED ITEMS ARE OPTIONAL, SEE B.O.M. FOR APPLICATION.

NOTES:

FIND	QTY	REFERENCE	DRAWING	DESCRIPTION

TOLERANCES
.XXX: ±0.010
.XX: ±.03
.X: ±.1
FRAC: ±1/32
ANG: ±1°
UNLESS OTHERWISE SPECIFIED

DO NOT SCALE THIS DRAWING

SCALE 1:2

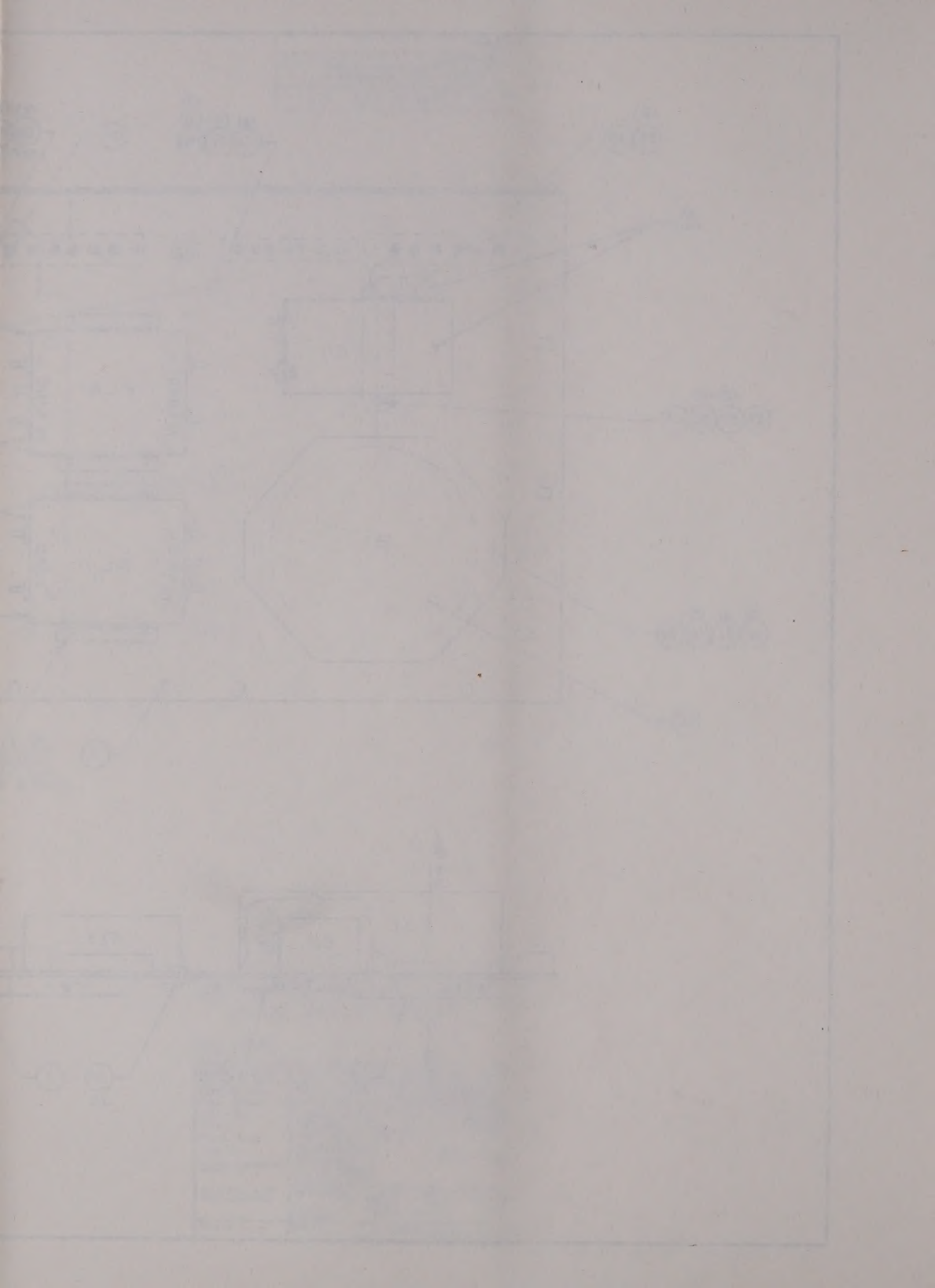
DRAWN 2/13/81 Tony
CHECKED
APPROVED 2/19/81
RELEASED 3/9/81
QA

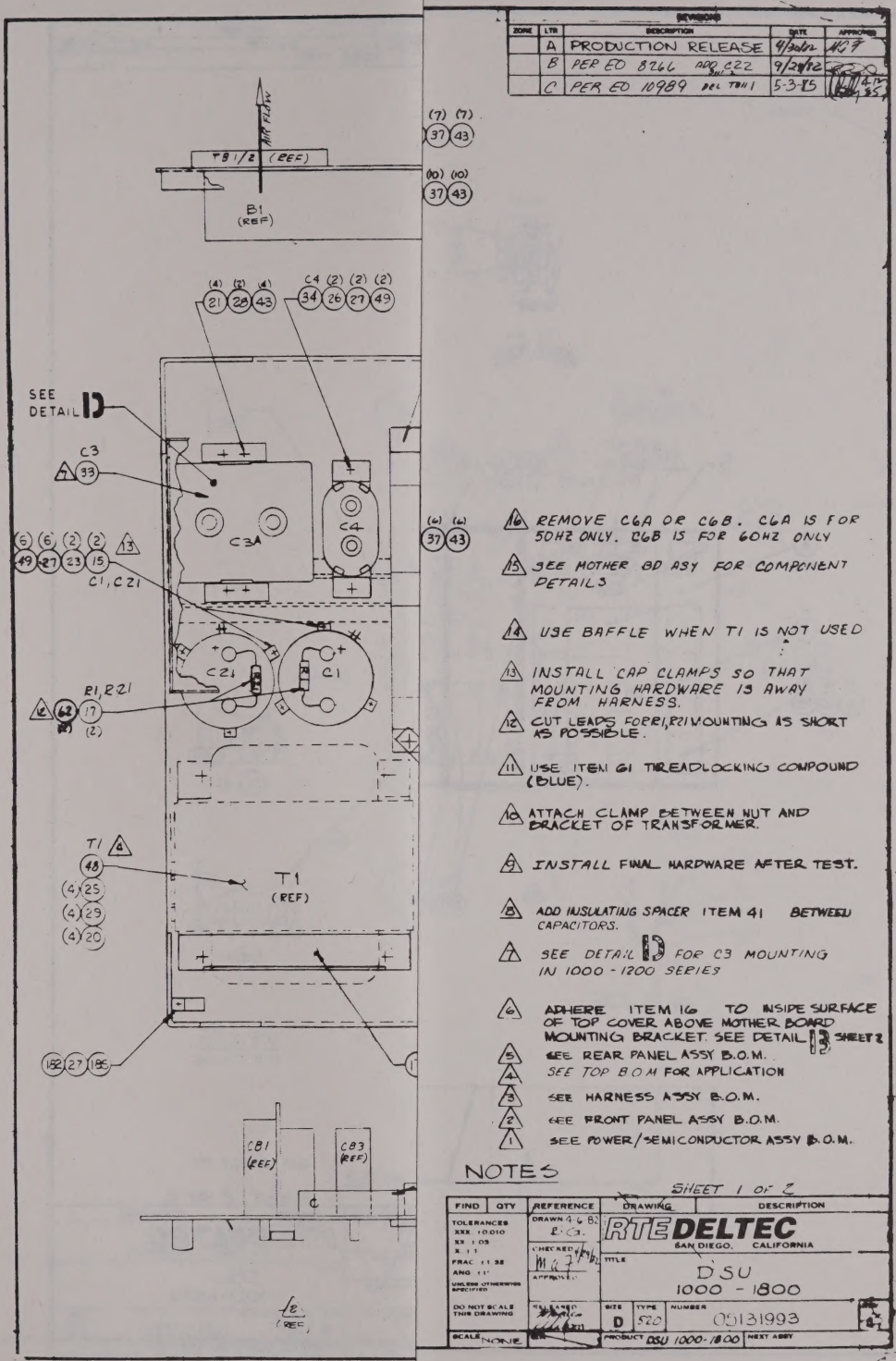
RTE DELTEC
SAN DIEGO, CALIFORNIA

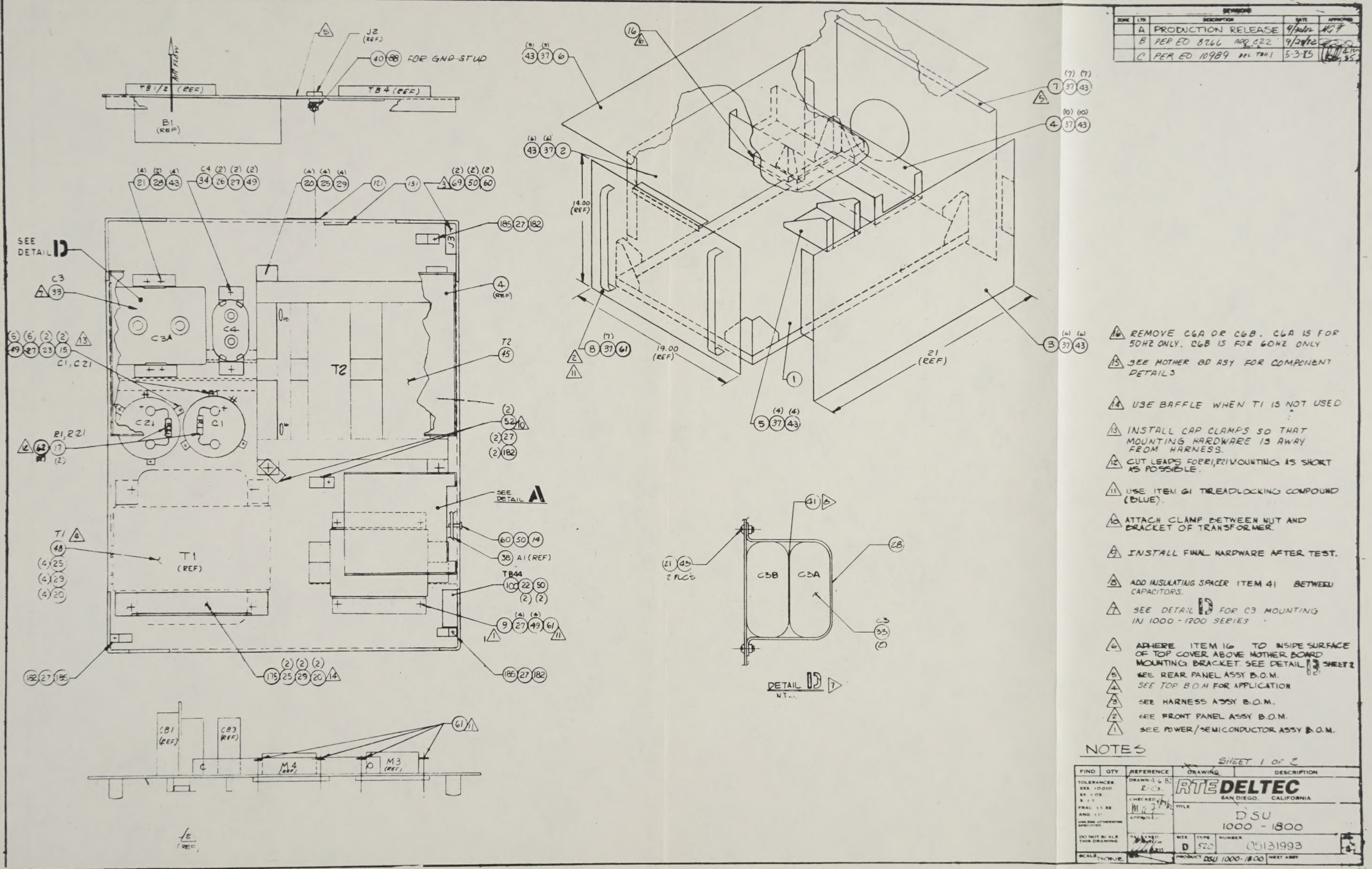
TITLE
PANEL, REAR

SIZE	TYPE	NUMBER	REV
C	63	05130355	B

PRODUCT DSU 1000-1800 | NEXT ASSY




REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
A | PRODUCTION RELEASE | 4/30/82
B | PER ECO 8266 ADD C22 | 9/28/82
C | PER ECO 10989 DEL T0111 | 5-3-85
AIR FLOW
T81/2 (REF)
B1 (REF)
(7) (7) 37 43
(10) (10) 37 43
(4) (2) (4) 21 28 43
C4 (2) (2) (2) 34 26 27 49
SEE DETAIL D
C3
7 33
C3A
C4
(6) (6) (2) (2) 13 49 27 23 15
C1, C21
C21
C1
R1, R21
12 42 17 (2)
T1 6
48
T1 (REF)
(4) 25
(4) 29
(4) 20
(2) 27 18
CB1 (REF)
CB3 (REF)
(4) (4) 37 43
16 REMOVE C6A OR C6B. C6A IS FOR 50HZ ONLY. C6B IS FOR 60HZ ONLY
15 SEE MOTHER BD ASY FOR COMPONENT DETAILS
14 USE BAFFLE WHEN T1 IS NOT USED
13 INSTALL CAP CLAMPS SO THAT MOUNTING HARDWARE IS AWAY FROM HARNESS.
12 CUT LEADS FOR R1, R21 MOUNTING AS SHORT AS POSSIBLE.
11 USE ITEM 61 THREADLOCKING COMPOUND (BLUE).
10 ATTACH CLAMP BETWEEN NUT AND BRACKET OF TRANSFORMER.
9 INSTALL FINAL HARDWARE AFTER TEST.
8 ADD INSULATING SPACER ITEM 41 BETWEEN CAPACITORS.
7 SEE DETAIL D FOR C3 MOUNTING IN 1000 - 1200 SERIES
6 ADHERE ITEM 16 TO INSIDE SURFACE OF TOP COVER ABOVE MOTHER BOARD MOUNTING BRACKET. SEE DETAIL B SHEET 2
5 SEE REAR PANEL ASSY B.O.M.
4 SEE TOP B.O.M FOR APPLICATION
3 SEE HARNESS ASSY B.O.M.
2 SEE FRONT PANEL ASSY B.O.M.
1 SEE POWER/SEMICONDUCTOR ASSY B.O.M.
NOTES
SHEET 1 OF 2
FIND | QTY | REFERENCE | DRAWING | DESCRIPTION
TOLERANCES XXX ±.010 XX ±.03 X ±.1 FRAC ±1/32 ANG ±1° UNLESS OTHERWISE SPECIFIED
DRAWN 4-6-82 R.G.
CHECKED
APPROVED
DO NOT SCALE THIS DRAWING
SCALE NONE
RTE DELTEC SAN DIEGO, CALIFORNIA
TITLE DSU 1000 - 1800
SIZE D TYPE 520 NUMBER 05131993 REV C
PRODUCT DSU 1000-1800 NEXT ASSY



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PRODUCTION RELEASE	4/30/92	MS
	B	PER ED 8246 ADD C22	9/28/92	
	C	PER ED 10989 DEL TB#1	5-3-95	

16. REMOVE C6A OR C6B. C6A IS FOR 50HZ ONLY. C6B IS FOR 60HZ ONLY
15. SEE MOTHER BD ASY FOR COMPONENT DETAILS
14. USE BAFFLE WHEN T1 IS NOT USED
13. INSTALL CAP CLAMPS SO THAT MOUNTING HARDWARE IS AWAY FROM HARNESS.
12. CUT LEADS FOR R1, R21 MOUNTING AS SHORT AS POSSIBLE.
11. USE ITEM 61 THREADLOCKING COMPOUND (BLUE).
10. ATTACH CLAMP BETWEEN NUT AND BRACKET OF TRANSFORMER.
9. INSTALL FINAL HARDWARE AFTER TEST.
8. ADD INSULATING SPACER ITEM 41 BETWEEN CAPACITORS.
7. SEE DETAIL D FOR C3 MOUNTING IN 1000 - 1200 SERIES
6. ADHERE ITEM 16 TO INSIDE SURFACE OF TOP COVER ABOVE MOTHER BOARD MOUNTING BRACKET. SEE DETAIL B SHEET 2
5. SEE REAR PANEL ASSY B.O.M.
4. SEE TOP B.O.M FOR APPLICATION
3. SEE HARNESS ASSY B.O.M.
2. SEE FRONT PANEL ASSY B.O.M.
1. SEE POWER/SEMICONDUCTOR ASSY B.O.M.

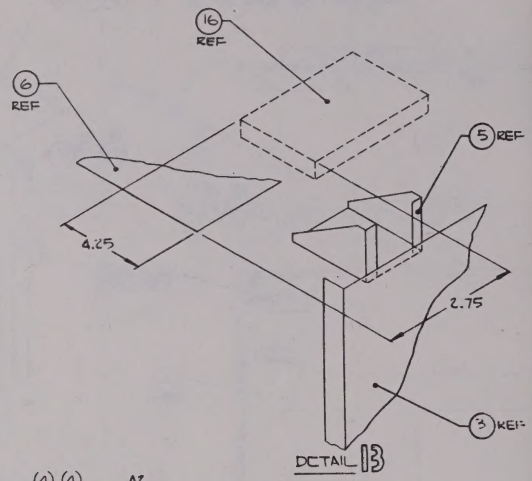
NOTES

SHEET 1 OF 2

FIND	QTY	REFERENCE	DRAWING	DESCRIPTION
		DRAWN 4-6-92 E.C.G.	RTE DELTEC SAN DIEGO, CALIFORNIA	
		CHECKED	TITLE	DSU 1000 - 1800
		APPROVED	SIZE D	TYPE 520
			NUMBER 05131993	REV C
			PRODUCT DSU 1000-1800	NEXT ASSY

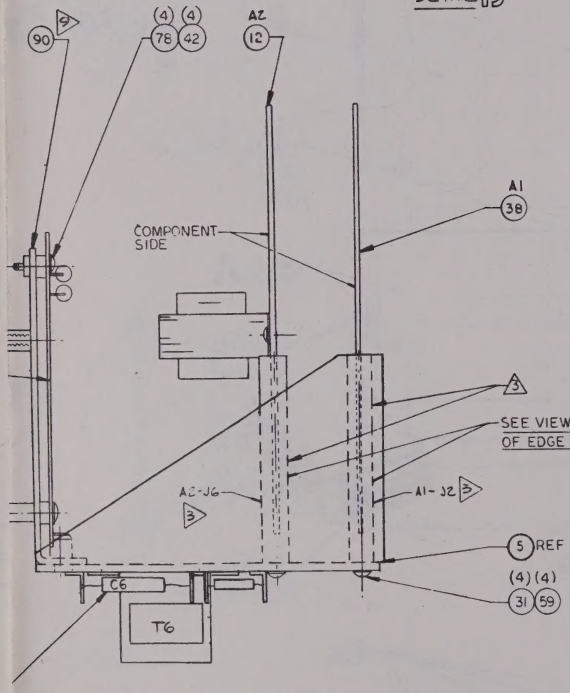
TOLERANCES: XXX ±.010, XX ±.03, X ±.1, FRAC ±1/32, ANG ±1°. UNLESS OTHERWISE SPECIFIED. DO NOT SCALE THIS DRAWING. SCALE NONE.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		

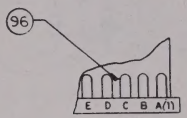


DETAIL B

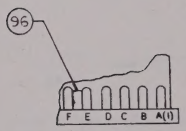
TOOTH



VIEW A1
(REF)



12 A2



38 A1

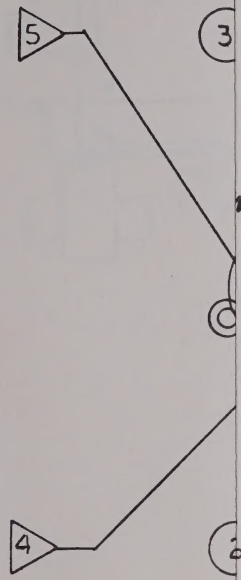
VIEW G
SCALE: NONE

NOTES: SEE SHEET #1

SHEET 2 OF 2

FIND	QTY	REFERENCE	DRAWING	DESCRIPTION
TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED		DRAWN	RTE DELTEC SAN DIEGO, CALIFORNIA	
		CHECKED		
		APPROVED	TITLE DSU 1000-1800	
DO NOT SCALE THIS DRAWING		RELEASED	SIZE D / TYPE 520 / NUMBER 05131993	REV P
SCALE None		AA	PRODUCT DSU 1000-1800	NEXT ASSY

REVISIONS		
	DATE	APPROVED
	4/30/82	[illegible]
	5-6-82	[illegible]
VIEW TO C.I.D ON TO-	6/30/82	[illegible]



WIRES ON CID SIDE ONLY

1 & 2, 4 & 5, AND 6 & 7

D.

SEE SYSTEM W/L DSU.

ARE

05132013

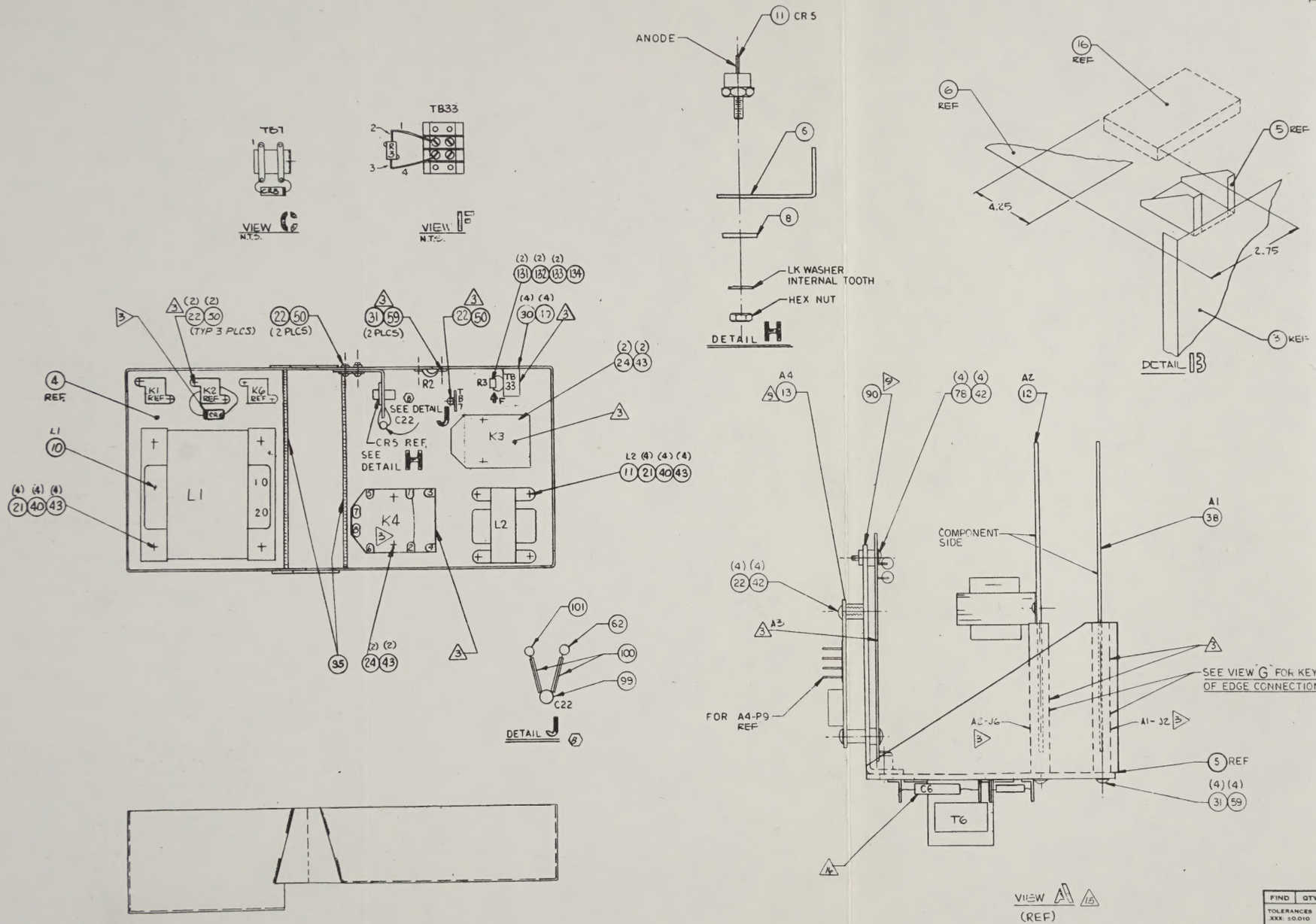
TE DELTEC

SAN DIEGO, CALIFORNIA

BRIDGE PROT/STAT
WORK

NUMBER	REV
05132013	C
SU	NEXT ASSY

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



NOTES: SEE SHEET #1

SHEET 2 OF 2

FIND	QTY	REFERENCE	DRAWING	DESCRIPTION

TOLERANCES
XXX: ±0.010
XX: ±.03
X: ±.1
FRAC: ±1/32
ANG: ±1°
UNLESS OTHERWISE SPECIFIED

DO NOT SCALE THIS DRAWING

SCALE NONE

DRAWN
CHECKED
APPROVED
RELEASED
QA

RTE DELTEC
SAN DIEGO, CALIFORNIA

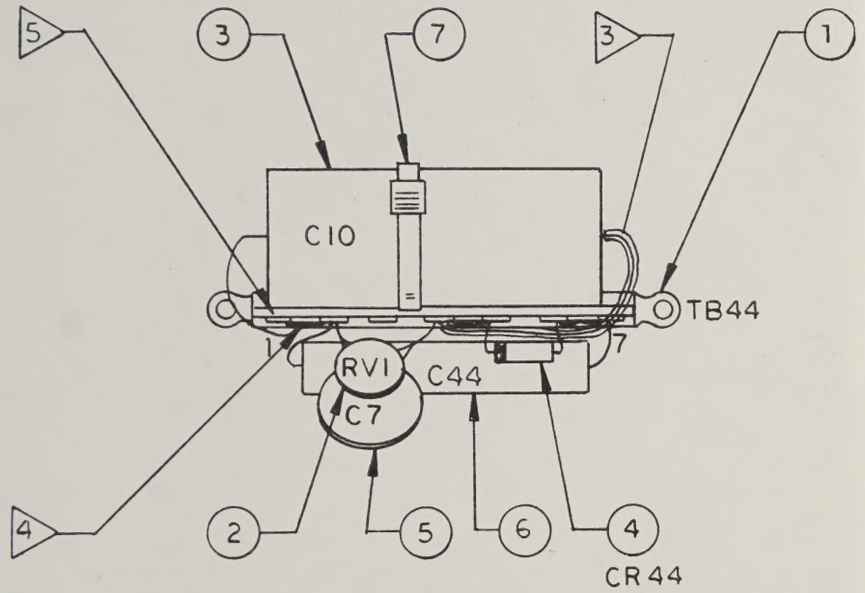
TITLE
DSU
1000-1800

SIZE	TYPE	NUMBER	REV
D	520	05131993	P

PRODUCT DSU 1000-1300

NEXT ASSY

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PRODUCTION RELEASE	4/30/82	BRL
	B	PER EO 7820	5-6-82	MLT
	C	PER EO 8116 REDRAW VIEW TO SHOW C10 ON TOP	6/30/82	SD Radley



5 INSTALL CONNECTING WIRES ON C10 SIDE ONLY

4 CONNECT TOGETHER 1 & 2, 4 & 5, AND 6 & 7 USING BUS WIRE

3 SLEEVE THIS LEAD.

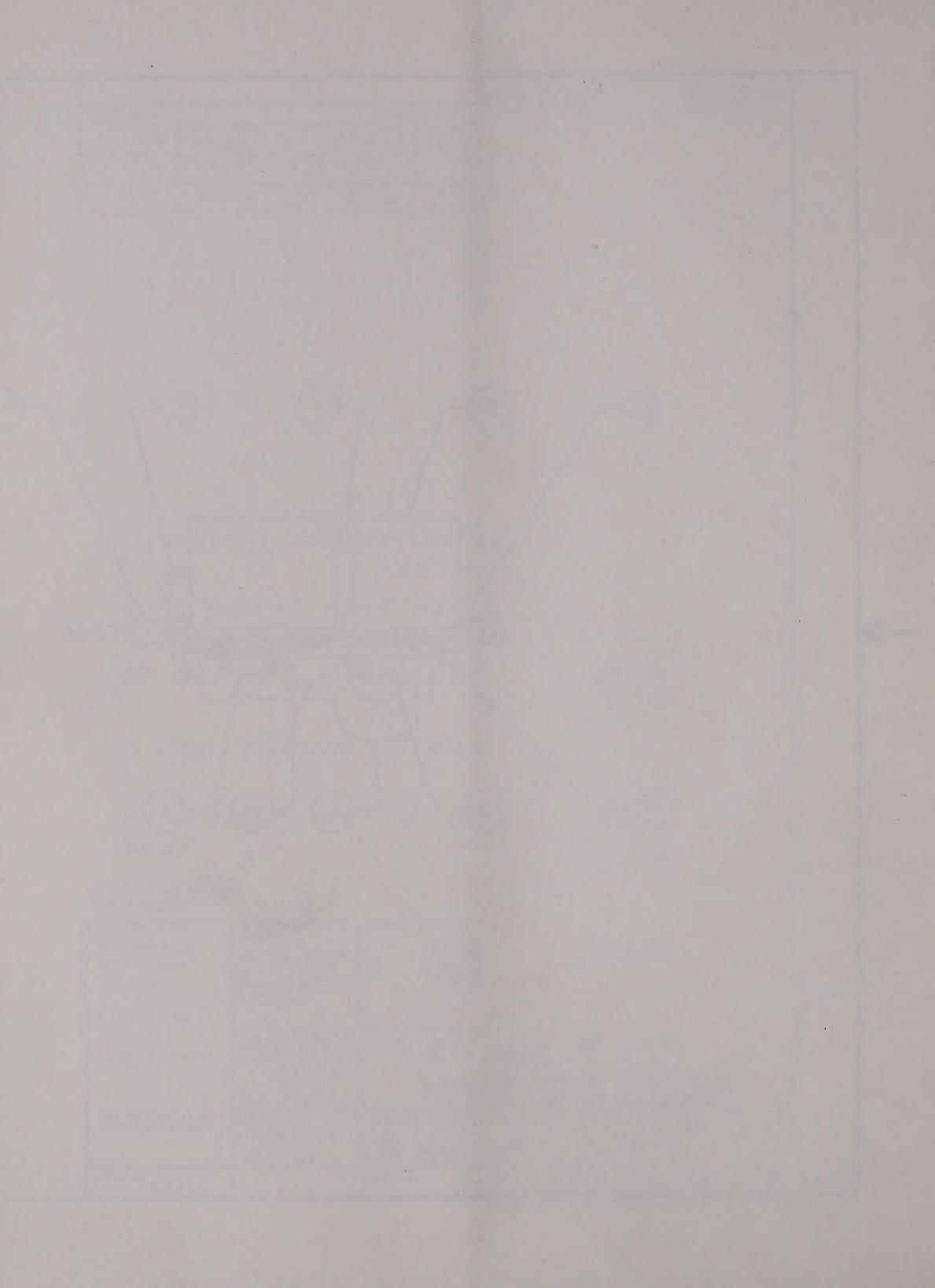
2. FOR WIRING DETAILS SEE SYSTEM W/L DSU.

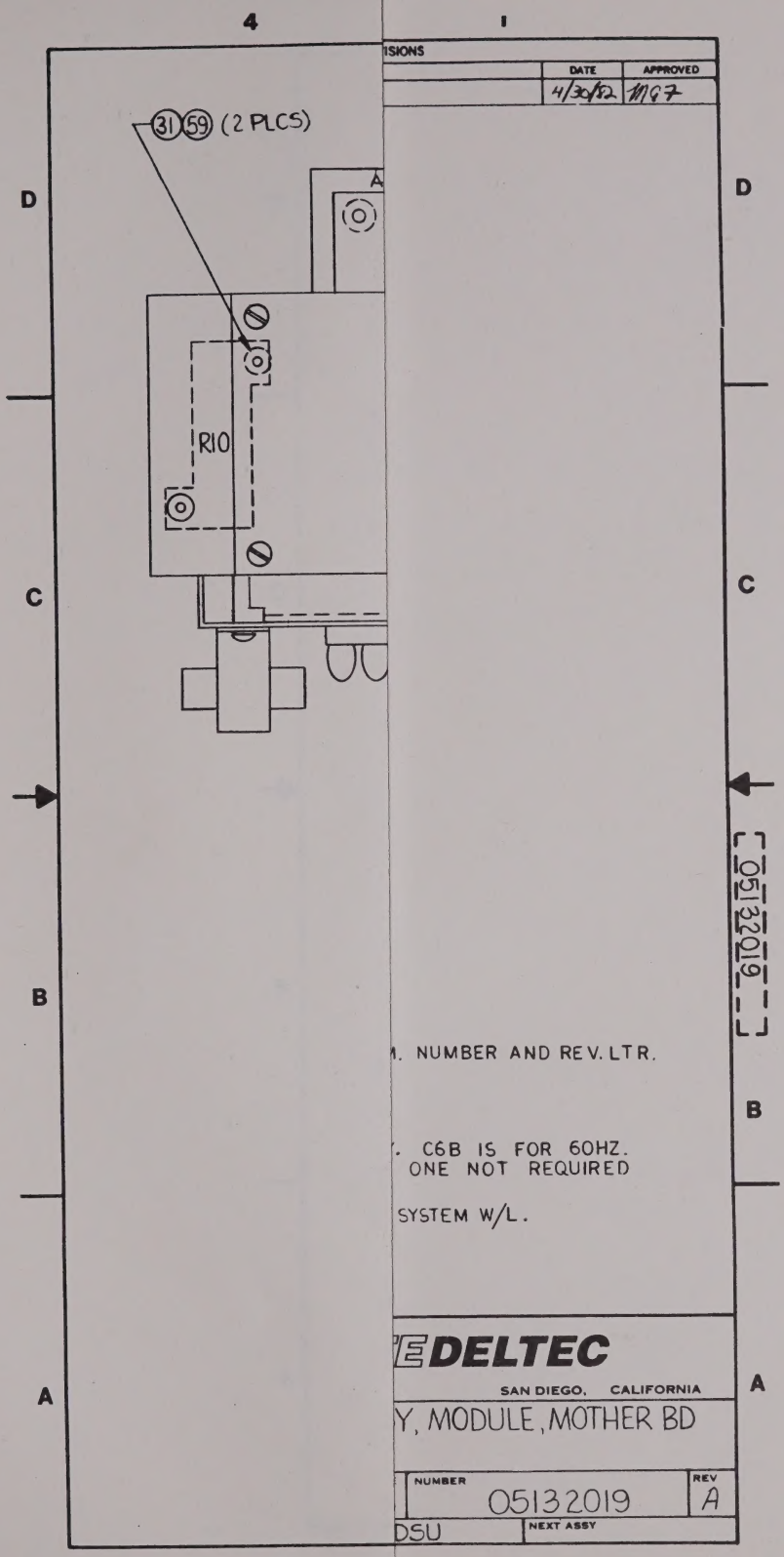
1. TERMINAL #3 IS SPARE

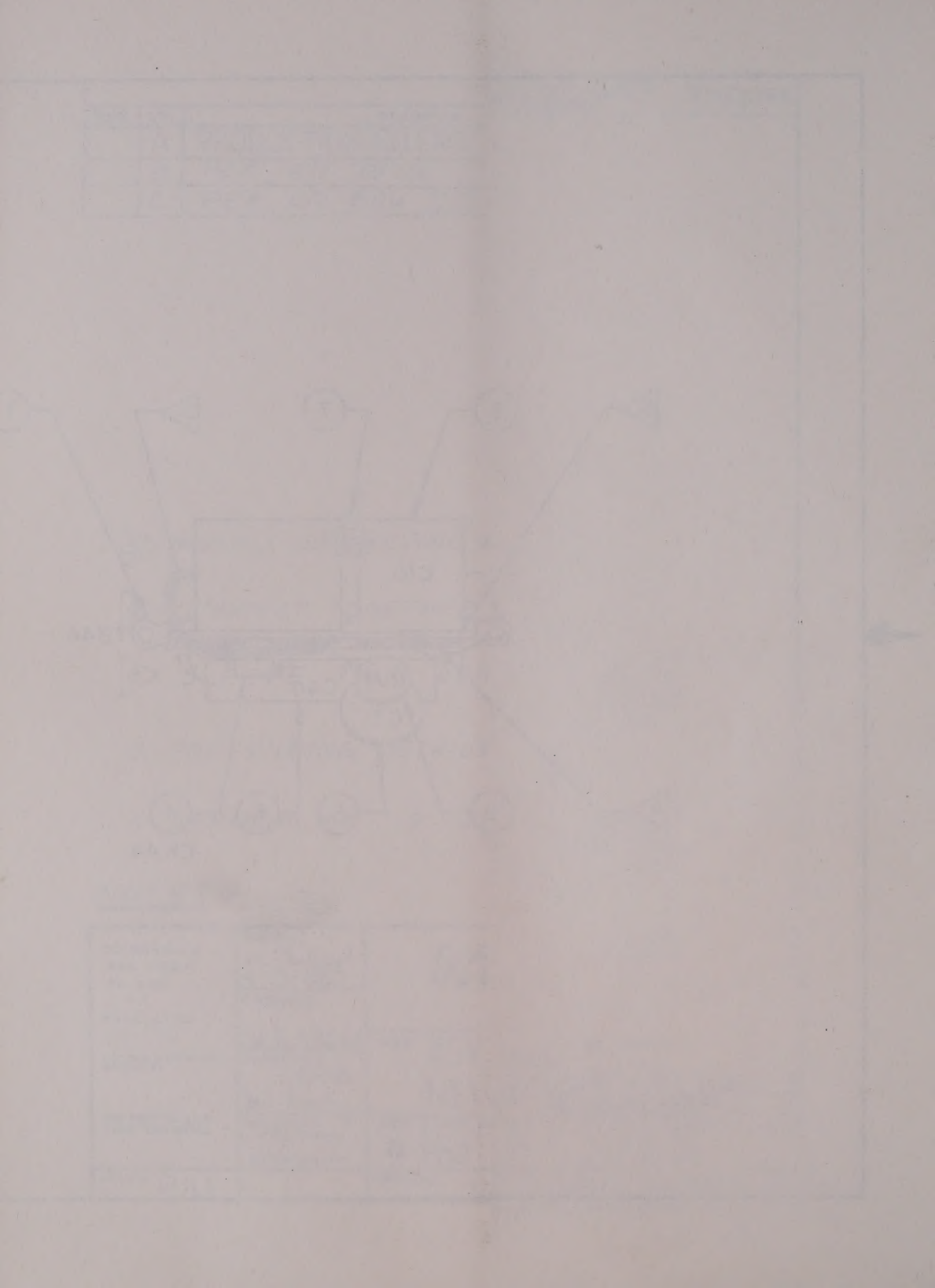
NOTES —

TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED DO NOT SCALE THIS DRAWING	DRAWN S. Woolsey 4-19-82	RTE DELTEC SAN DIEGO, CALIFORNIA			
	CHECKED BRL 4-26-82	TITLE ASY, BRIDGE PROT/STAT NETWORK			
	APPROVED M.G. Trudy 4/29/82				
	RELEASED Monica Wilson	SIZE B	CODE 63	NUMBER 05132013	REV C
SCALE FULL		PRODUCT DSU		NEXT ASSY	

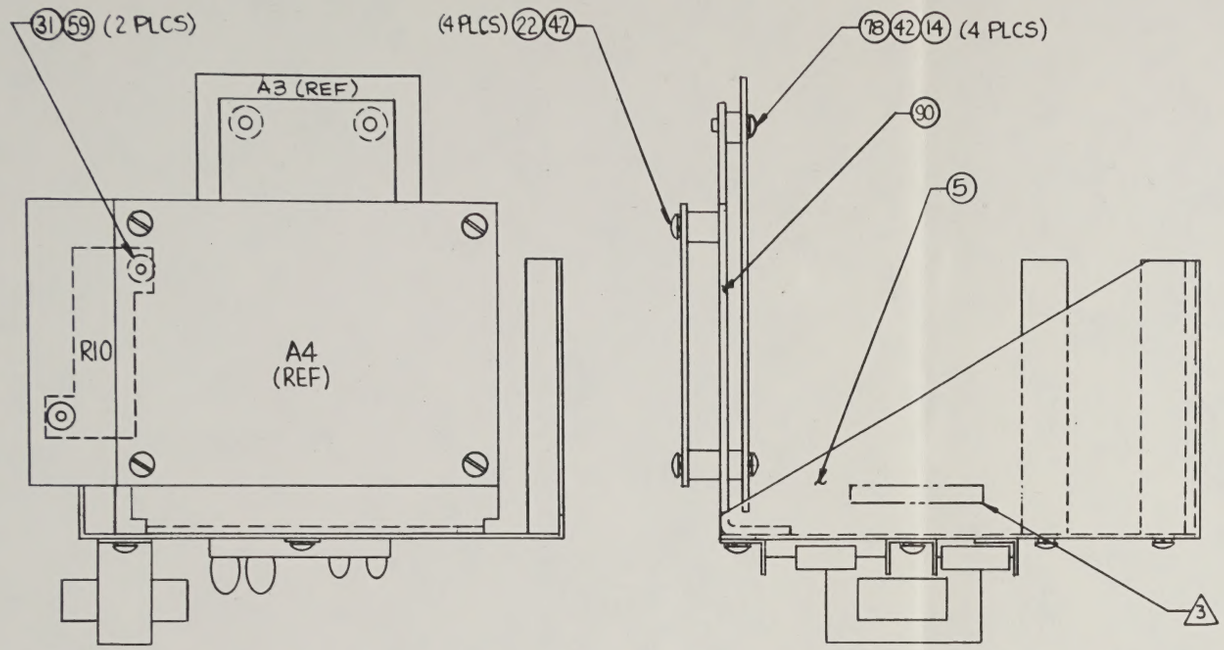
05132013

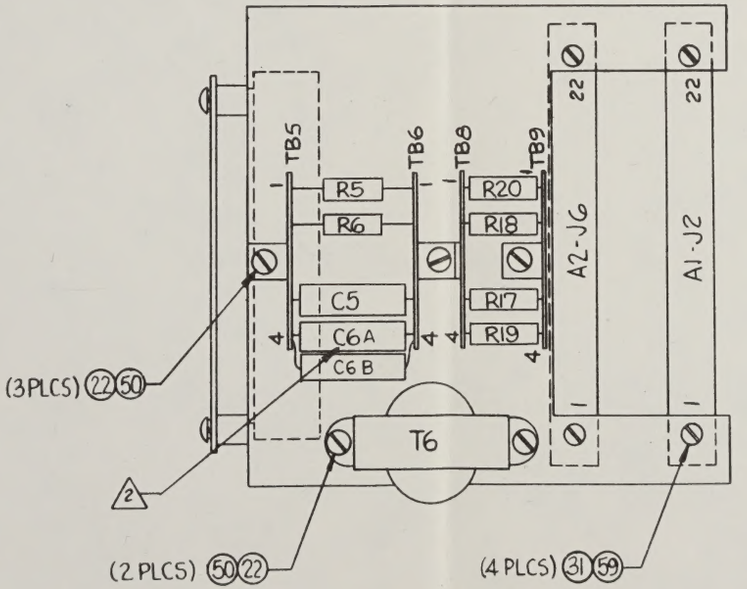



4
1
ISIONS
DATE
APPROVED
4/30/82
(31) (59) (2 PLCS)
A
R10
D
C
B
A
05132019
. NUMBER AND REV. LTR.
. C6B IS FOR 60HZ.
ONE NOT REQUIRED
SYSTEM W/L.
EDELTEC
SAN DIEGO, CALIFORNIA
Y, MODULE, MOTHER BD
NUMBER
05132019
REV
A
DSU
NEXT ASSY
4
1



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PROD RELEASE	4/30/82	MGF





(3) PERMANENTLY MARK B.O.M. NUMBER AND REV. LTR. AS SHOWN.

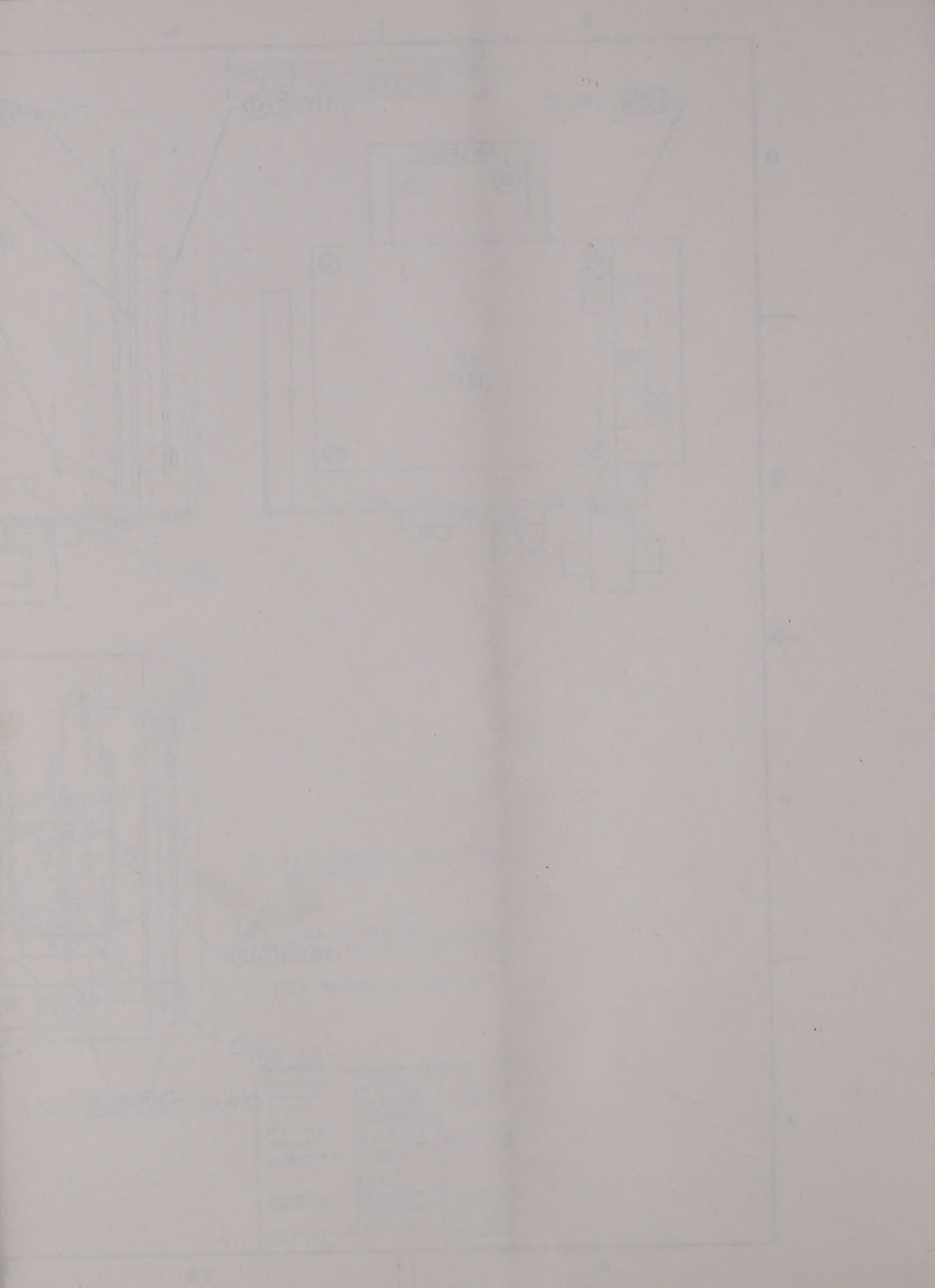
(2.) C6A IS FOR 50HZ ONLY. C6B IS FOR 60HZ. TEST TO CUT OUT THE ONE NOT REQUIRED

1. FOR WIRING DETAILS SEE SYSTEM W/L.

NOTES-

TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN 4-20-82	RTE DELTEC SAN DIEGO, CALIFORNIA			
	CHECKED 4/21/82	TITLE ASY, MODULE, MOTHER BD			
	APPROVED				
DO NOT SCALE THIS DRAWING	RELEASED	SIZE C	CODE 63	NUMBER 05132019	REV A
SCALE FULL		PRODUCT DSU		NEXT ASSY	

05132019



REVISIONS		
DESCRIPTION	DATE	APPROVED
ROD. RELEASE	5/10/82	
08451 ADDED FLAGNOTES 6 & 7 & 1 JUMPER	11-23-82	
PER EO 10531 ADD C25 INC ECO 8538A	7-13-84	
PER EO 10651 CHANGE NOTE 2	23 Aug 84	
PER EO 11037 DELETE CR24	5-3-85	
PER EO 11286	12-6-85	
PER EO 11513	3-13-86	

IRCUIT SIDE, SOLDER ONE LEAD OF R71 TO CR22
E. SOLDER OTHER LEAD TO THE LOWER PAD
61.

IRCUIT SIDE, SOLDER POSITIVE LEAD OF C25 TO U1-1
SOLDER OTHER LEAD TO U1-3.

ACH WITH RTV APPROX. WHERE SHOWN.

ALL 28GA. GREEN JUMPER WIRE FROM CR19 ANODE
EED-THRU BETWEEN R40 & CR1.

3, 19, & 40 TO BE RAISED A MIN. OF .125 ABOVE BD.

, & 50 TO BE RAISED A MIN. OF .25 ABOVE BD.

BOM FOR VALUE.

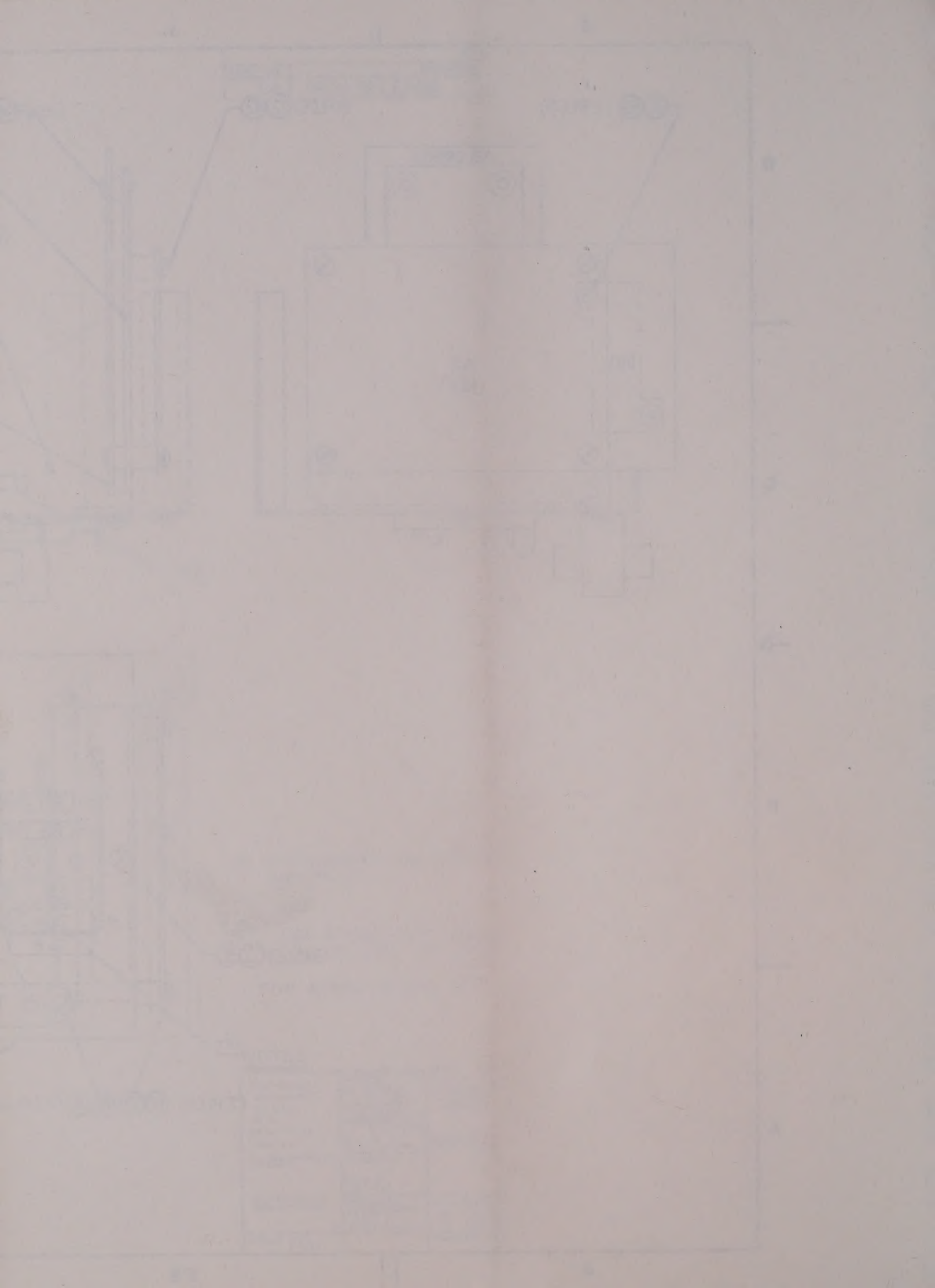
ALL TRANSIPADS UNDER Q4, Q5, & Q12.

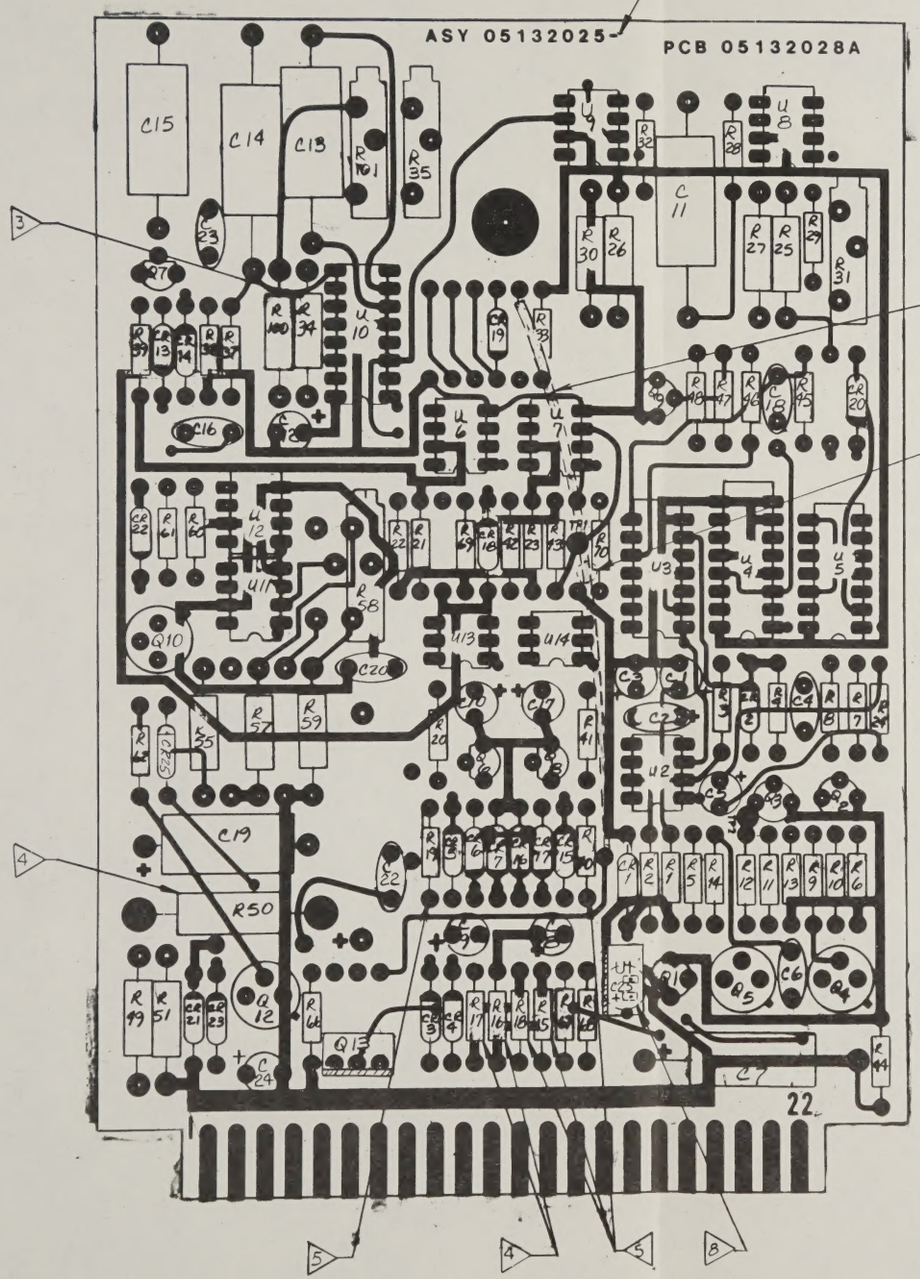
ANENTLY MARK DASH NUMBER AND REV. LTR.
OXIMATELY WHERE SHOWN.

UNLESS OTHERWISE SPECIFIED

DRAWN 4/82	RTE DELTEC SAN DIEGO, CALIFORNIA			
CHECKED 5-10-82	TITLE ASY PLL DR SENSOR			
APPROVED				
RELEASED 5-10-82	SIZE C	CODE 520	NUMBER 05132026	REV G
	PRODUCT DSU		NEXT ASSY	

05132026





REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PROD. RELEASE	5/10/82	
	B	EO 8451 ADDED FLAGNOTES 6 & 7 & 1 JUMPER	11-23-82	
	D	PER EO 10531 ADD C25 INC ECO 8338A	7-13-84	
	D1	PER EO 10651 CHANGE NOTE 2	23 Aug 84	
	E	PER EO 11037 DELETE CR24	5-3-85	
	F	PER EO 11286	12-6-85	
	G	PER EO 11513	3-13-86	

9 ON CIRCUIT SIDE, SOLDER ONE LEAD OF R71 TO CR22 ANODE. SOLDER OTHER LEAD TO THE LOWER PAD OF R61.

8 ON CIRCUIT SIDE, SOLDER POSITIVE LEAD OF C25 TO U1-1 AND SOLDER OTHER LEAD TO U1-3.

7 ATTACH WITH RTV APPROX. WHERE SHOWN.

6 INSTALL 28GA. GREEN JUMPER WIRE FROM CR19 ANODE TO FEED-THRU BETWEEN R40 & CR1.

5 R15, 18, 19, & 40 TO BE RAISED A MIN. OF .125 ABOVE BD.

4 R16, 17, & 50 TO BE RAISED A MIN. OF .25 ABOVE BD.

3 SEE BOM FOR VALUE.

2. INSTALL TRANSIPADS UNDER Q4, Q5, & Q12.

1 PERMANENTLY MARK DASH NUMBER AND REV. LTR. APPROXIMATELY WHERE SHOWN.

NOTES - UNLESS OTHERWISE SPECIFIED

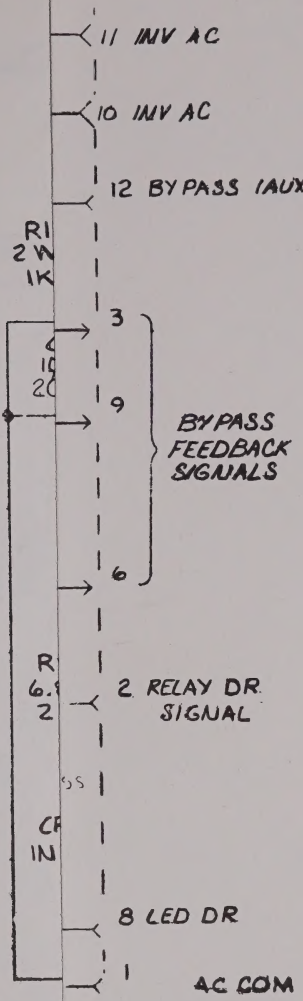
TOLERANCES .XXX ±0.010 XX ±.03 X ±.1 FRAC ±1/32 ANG ±1 UNLESS OTHERWISE SPECIFIED	DRAWN [illegible] 4/82	RTE DELTEC SAN DIEGO, CALIFORNIA	
	CHECKED 5-10-82	TITLE ASY PLL DR SENSOR	
DO NOT SCALE THIS DRAWING	APPROVED		
SCALE 2:1	RELEASED 5-10-82	SIZE C / CODE 520 / NUMBER 05132026	REV G
		PRODUCT DSU	NEXT ASSY

05132026

XII. SCHEMATIC DRAWINGS

The following schematic drawings comprise Section XII of this manual and are presented in numerical order as shown.

Part Number	Title
05123594	AC Sensor & Relay Driver
05129828	Battery Charger Control 1 Phase
05132004	System DSU 1000-1800
05132014	Bridge Protec/Status Network
05132027	PLL Driver Sensor
05132029	Snubber/Filter DSU



CONFIGURATIONS - SEE TABLE

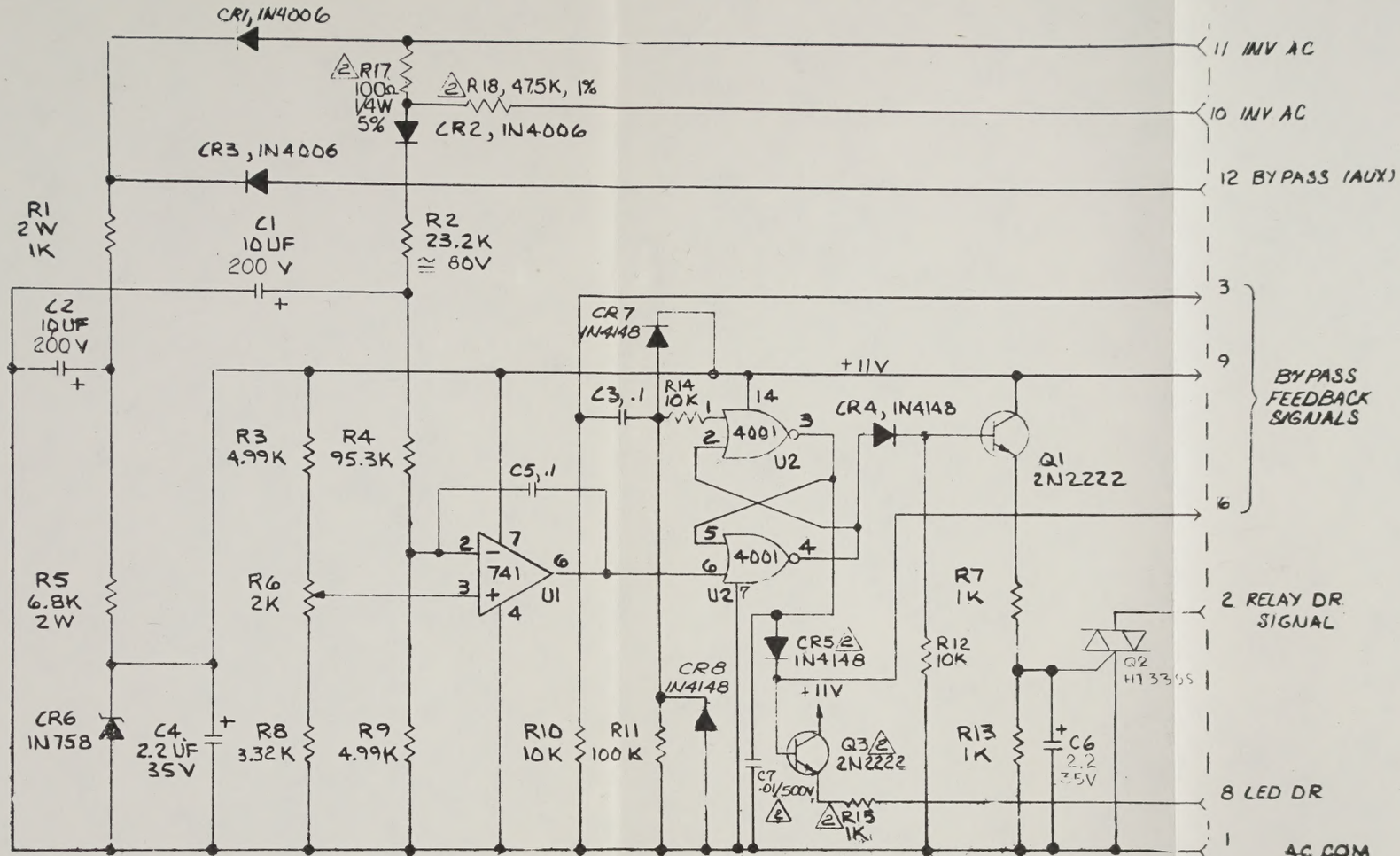
ZONE	LTR		DESCRIPTION
	G	PER E.O.	
	F	PER E	
	E1	PER ECO	
	E	PER ECO	
	D	PER E	
	C	PER ECO	
	B	ECO 02	
	A	ECO 0	

RTE DELTEC

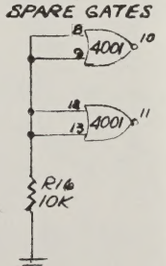
AC SENSOR & RELAY DRIVE

SIZE	TYPE	NUMBER	REV
C	64	5123594	

NEXT ASSY



U2 SPARE GATES



② DASH CONFIGURATIONS

DASH NO.	COMPONENT VARIATION	APPLICATION
-1	CR5, Q3, R15, R18, C7 NOT USED	120 VAC OUTPUT W/O LED DRIVE
-2	R18 NOT USED	120 VAC OUTPUT W/ LED DRIVE
-3	R17 NOT USED	220 OR 240 VAC OUTPUT W/ LED DR

② DASH CONFIGURATIONS - SEE TABLE

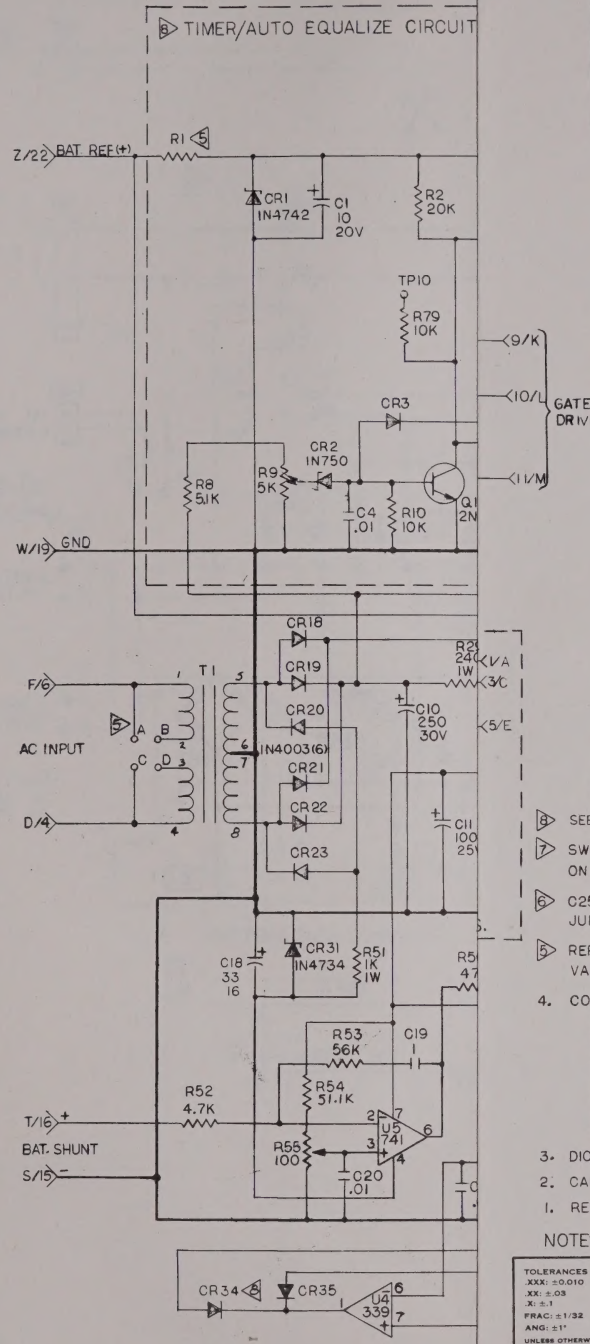
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	G	PER E.O. 9173	5-12-83	[illegible]
	F	PER E.O 6267 ADDED C7	6-17-81	
	E1	PER ECO 4588/TITLE	9-25-80	
	E	PER ECO 3548	6/12/79	
	D	PER ECO 1651	7/8/78	
	C	PER ECO 0602		
	B	ECO 0239 EM 10-10-75		
	A	ECO 0129		

REVISIONS

RTE DELTEC

AC SENSOR & RELAY DRIVE

SIZE C | TYPE 64 | NUMBER 5123594 | REV



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	X	ENG. RELEASE CHGD CCS # R24	1-19-81	[illegible]
	A	PROD. RELEASE	1-9-81	[illegible]
	B	PER EO 6337	6-12-81	[illegible]
	C	PER EO 6270 ADD R81 & Q10	6-18-81	[illegible]
	D	PER EO 6373	7-16-81	[illegible]
	E	PER EO 6502	7-29-81	[illegible]
	F	PER EO 6645	8-21-81	[illegible]
	G	PER EO 6736	9-29-81	[illegible]
	H	PER EO 11494 DEL 223,27 CHG 28,29	2-13-84	[illegible]

6 SEE CONTROLLING BOM'S FOR CIRCUIT APPLICATION.

7 SWITCH S1 WIRED EXTERNALLY VIA PINS 17, 18, & 20 ON DSU.

6 C25 INSTALLED FOR TEST. REMOVE AND REPLACE WITH JUMPER AFTER TEST.

5 REFER TO INDIVIDUAL DASH OF BOM. FOR COMPONENT VALUE AND JUMPERING INSTRUCTIONS.

4. COMPONENT TABLE

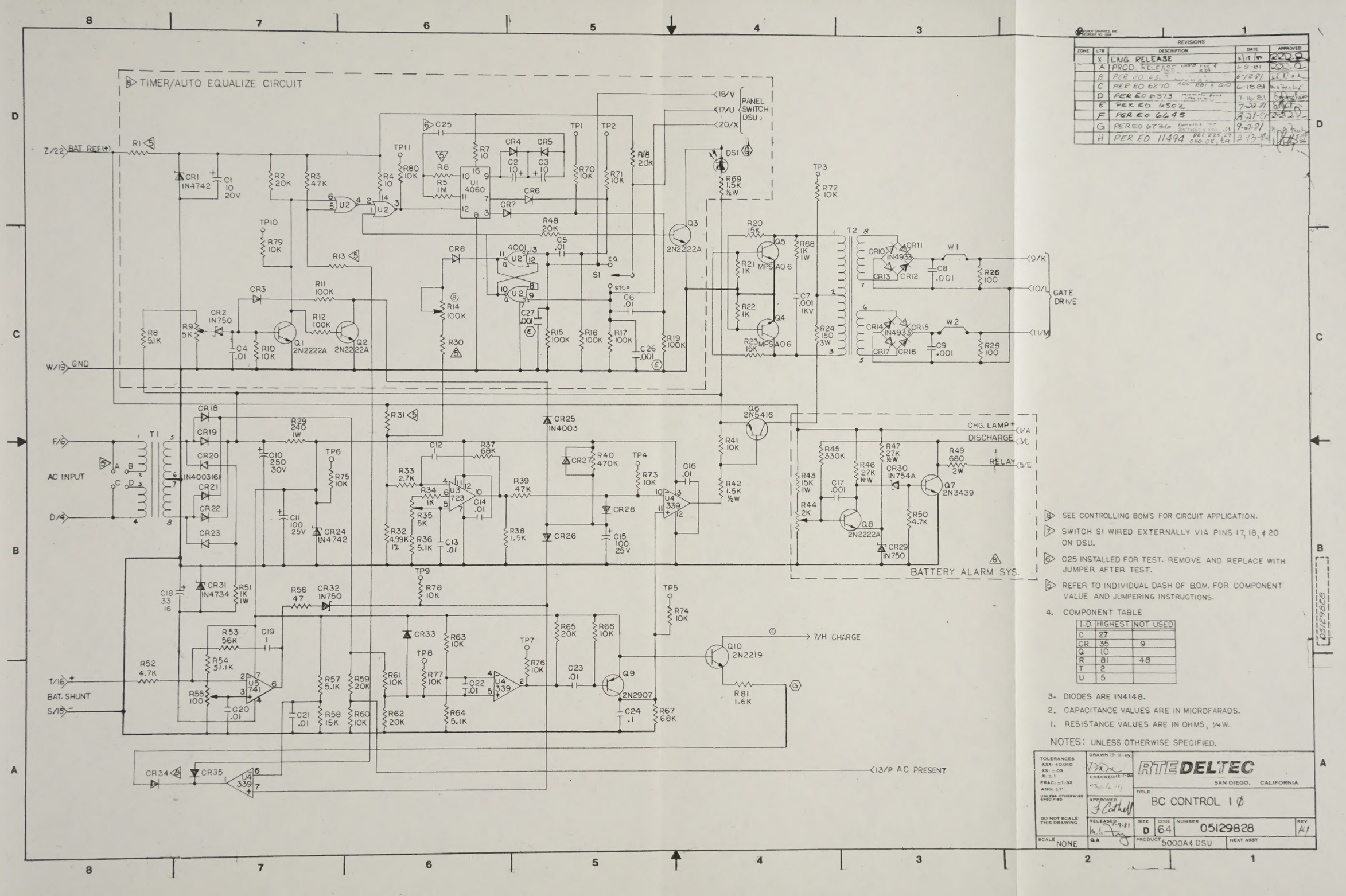
I.D.	HIGHEST	NOT USED
C	27	
CR	35	9
Q	10	
R	81	48
T	2	
U	5	

3. DIODES ARE IN4148.
2. CAPACITANCE VALUES ARE IN MICROFARADS.
1. RESISTANCE VALUES ARE IN OHMS, ¼W.

NOTES: UNLESS OTHERWISE SPECIFIED.

TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN 11-11-80	RTE DELTEC SAN DIEGO, CALIFORNIA	
	CHECKED 12-1-80	TITLE BC CONTROL 1 Ø	
DO NOT SCALE THIS DRAWING	APPROVED F. Cathell		
	RELEASED 1-9-81	SIZE D / CODE 64 / NUMBER 05129828	REV K/1
SCALE NONE	QA	PRODUCT 5000A & DSU	NEXT ASSY

05129828



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	X	ENG. RELEASE	8-17-80	
	A	PROD. RELEASE	1-9-81	
	B	PER EO 6310	6-1-81	
	C	PER EO 6270	6-18-81	
	D	PER EO 6373	7-16-81	
	E	PER EO 6502	7-29-81	
	F	PER EO 6645	8-21-81	
	G	PER EO 6736	9-21-81	
	H	PER EO 11494	2-17-84	

5. SEE CONTROLLING BOM'S FOR CIRCUIT APPLICATION.
7. SWITCH S1 WIRED EXTERNALLY VIA PINS 17, 18, & 20 ON DSU.
6. C25 INSTALLED FOR TEST. REMOVE AND REPLACE WITH JUMPER AFTER TEST.
5. REFER TO INDIVIDUAL DASH OF BOM. FOR COMPONENT VALUE AND JUMPERING INSTRUCTIONS.

4. COMPONENT TABLE

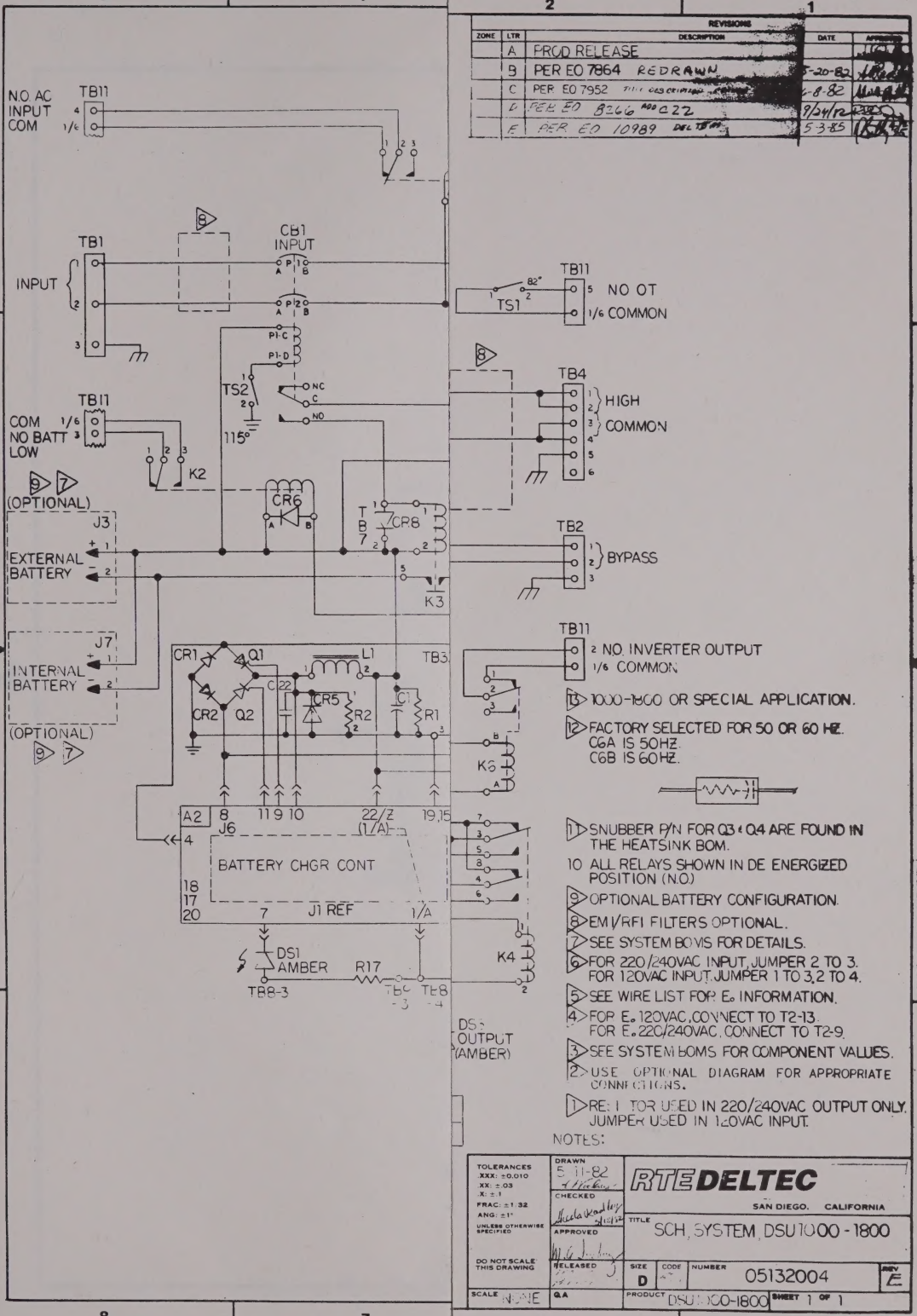
I.D.	HIGHEST	NOT USED
C	27	
CR	35	9
Q	10	
R	81	48
T	2	
U	5	

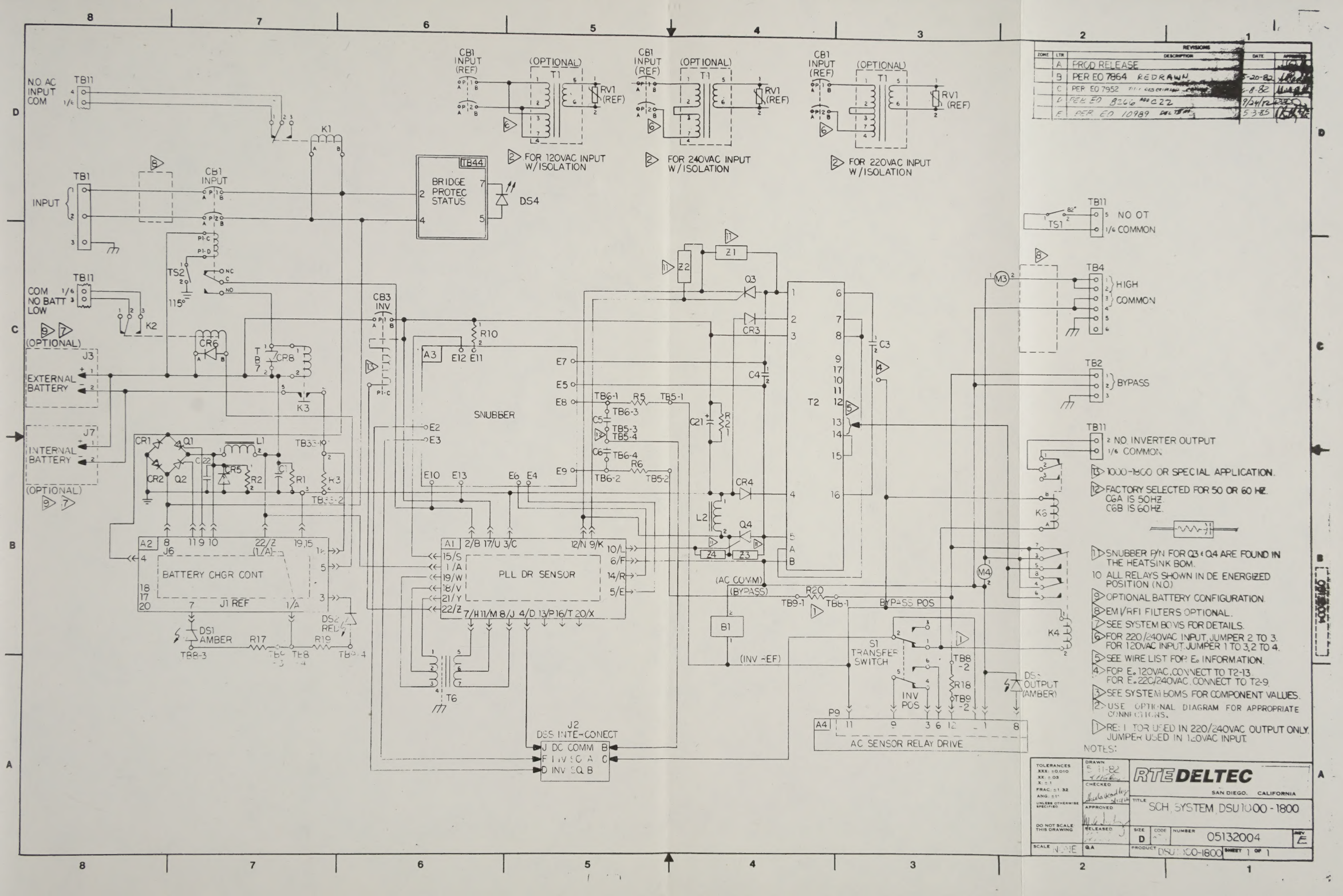
3. DIODES ARE IN4148.
2. CAPACITANCE VALUES ARE IN MICROFARADS.
1. RESISTANCE VALUES ARE IN OHMS, ¼W.

NOTES: UNLESS OTHERWISE SPECIFIED.

TOLERANCES XXX: ±0.010 XX: ±.03 X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN 11-11-80	RTE DELTEC SAN DIEGO, CALIFORNIA	
	CHECKED 12-1-80	TITLE BC CONTROL 1 Ø	
	APPROVED J. Cathell		
DO NOT SCALE THIS DRAWING	RELEASED 1-9-81	SIZE D / CODE 64 / NUMBER 05129828	REV H1
SCALE NONE	QA	PRODUCT 5000A & DSU	NEXT ASSY

05129828


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
A PROD RELEASE
B PER EO 7864 REDRAWN 5-20-82
C PER EO 7952 8-8-82
D PER EO 8266 AND C22 9/24/82
E PER EO 10989 5-3-85
NO AC INPUT COM
TB11
INPUT
TB1
CB1 INPUT
TS1
NO OT
COMMON
TB4
HIGH
COMMON
TS2
115°
NC
NO
COM
NO BATT LOW
K2
(OPTIONAL)
J3
EXTERNAL BATTERY
CR6
CR8
K3
TB2
BYPASS
J7
INTERNAL BATTERY
(OPTIONAL)
CR1
Q1
L1
TB3
CR2
Q2
C22
CR5
R2
C1
R1
K6
TB11
2 NO. INVERTER OUTPUT
1/6 COMMON
A2
J6
BATTERY CHGR CONT
J1 REF
DS1
AMBER
R17
TB8-3
K4
DS2
OUTPUT
(AMBER)
13 1000-1800 OR SPECIAL APPLICATION.
12 FACTORY SELECTED FOR 50 OR 60 HZ.
C6A IS 50HZ.
C6B IS 60HZ.
11 SNUBBER P/N FOR Q3 & Q4 ARE FOUND IN THE HEATSINK BOM.
10 ALL RELAYS SHOWN IN DE ENERGIZED POSITION (N.O.)
9 OPTIONAL BATTERY CONFIGURATION.
8 EMI/RFI FILTERS OPTIONAL.
7 SEE SYSTEM BOMS FOR DETAILS.
6 FOR 220/240VAC INPUT, JUMPER 2 TO 3.
FOR 120VAC INPUT, JUMPER 1 TO 3, 2 TO 4.
5 SEE WIRE LIST FOR E. INFORMATION.
4 FOR E. 120VAC, CONNECT TO T2-13.
FOR E. 220/240VAC, CONNECT TO T2-9.
3 SEE SYSTEM BOMS FOR COMPONENT VALUES.
2 USE OPTIONAL DIAGRAM FOR APPROPRIATE CONNECTIONS.
1 RE: 1 FOR USED IN 220/240VAC OUTPUT ONLY. JUMPER USED IN 120VAC INPUT.
NOTES:
TOLERANCES XXX: ±0.010 XX: ±.03 X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED
DO NOT SCALE THIS DRAWING
DRAWN 5-11-82
CHECKED
APPROVED
RELEASED
SCALE NONE
Q.A
RTE DELTEC
SAN DIEGO, CALIFORNIA
TITLE SCH, SYSTEM, DSU1000-1800
SIZE D
CODE
NUMBER 05132004
REV E
PRODUCT DSU1000-1800
SHEET 1 OF 1



ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
	A	PROD RELEASE		
	B	PER EO 7864 REDRAWN	5-20-82	
	C	PER EO 7952	6-8-82	
	D	PER ED B266 AND C22	9/24/82	
	E	PER EO 10989	5-3-85	

1000-1800 OR SPECIAL APPLICATION.

FACTORY SELECTED FOR 50 OR 60 HZ. C6A IS 50HZ. C6B IS 60HZ.

SNUBBER P/N FOR Q3 & Q4 ARE FOUND IN THE HEATSINK BOM.

10 ALL RELAYS SHOWN IN DE ENERGIZED POSITION (N.O.)

9 OPTIONAL BATTERY CONFIGURATION.

8 EMI/RFI FILTERS OPTIONAL.

7 SEE SYSTEM BOMS FOR DETAILS.

6 FOR 220/240VAC INPUT, JUMPER 2 TO 3. FOR 120VAC INPUT, JUMPER 1 TO 3, 2 TO 4.

5 SEE WIRE LIST FOR E. INFORMATION.

4 FOR E. 120VAC, CONNECT TO T2-13. FOR E. 220/240VAC, CONNECT TO T2-9.

3 SEE SYSTEM BOMS FOR COMPONENT VALUES.

2 USE OPTIONAL DIAGRAM FOR APPROPRIATE CONNECTIONS.

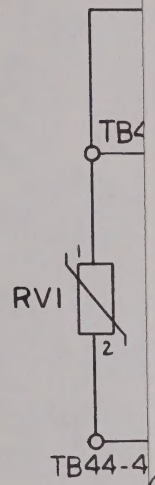
1 RE: 1 TOR USED IN 220/240VAC OUTPUT ONLY. JUMPER USED IN 120VAC INPUT.

NOTES:

TOLERANCES XXX: ±0.010, XX: ±.03, X: ±.1, FRAC: ±1/32, ANG: ±1°, UNLESS OTHERWISE SPECIFIED	DRAWN E. 11-82	RTE DELTEC	SAN DIEGO, CALIFORNIA
DO NOT SCALE THIS DRAWING	CHECKED	TITLE	SCH, SYSTEM, DSU1000-1800
SCALE NONE	APPROVED / RELEASED / Q.A.	SIZE D	CODE	NUMBER 05132004	REV E
		PRODUCT DSU1000-1800	SHEET 1 OF 1

REVISIONS		
	DATE	APPROVED
	4/30/82	

05132014



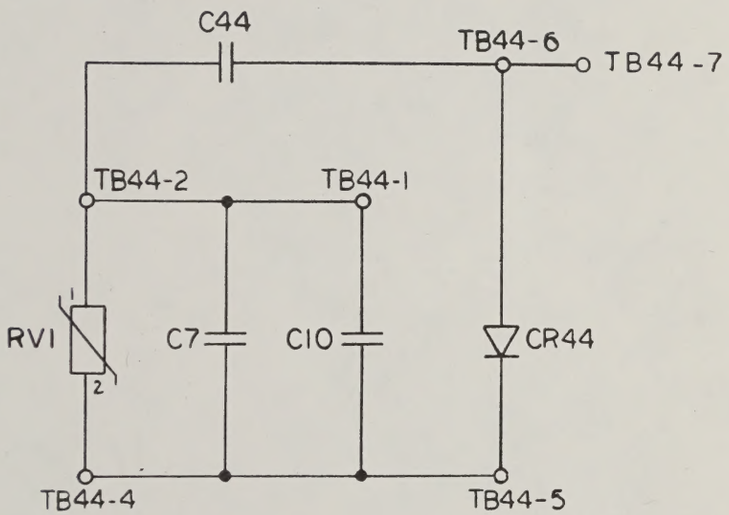
YSTEM W/L.

DELTEC

SAN DIEGO, CALIFORNIA

BRIDGE PROT STAT
VORK

UMBER	REV
05132014	A
U	NEXT ASSY



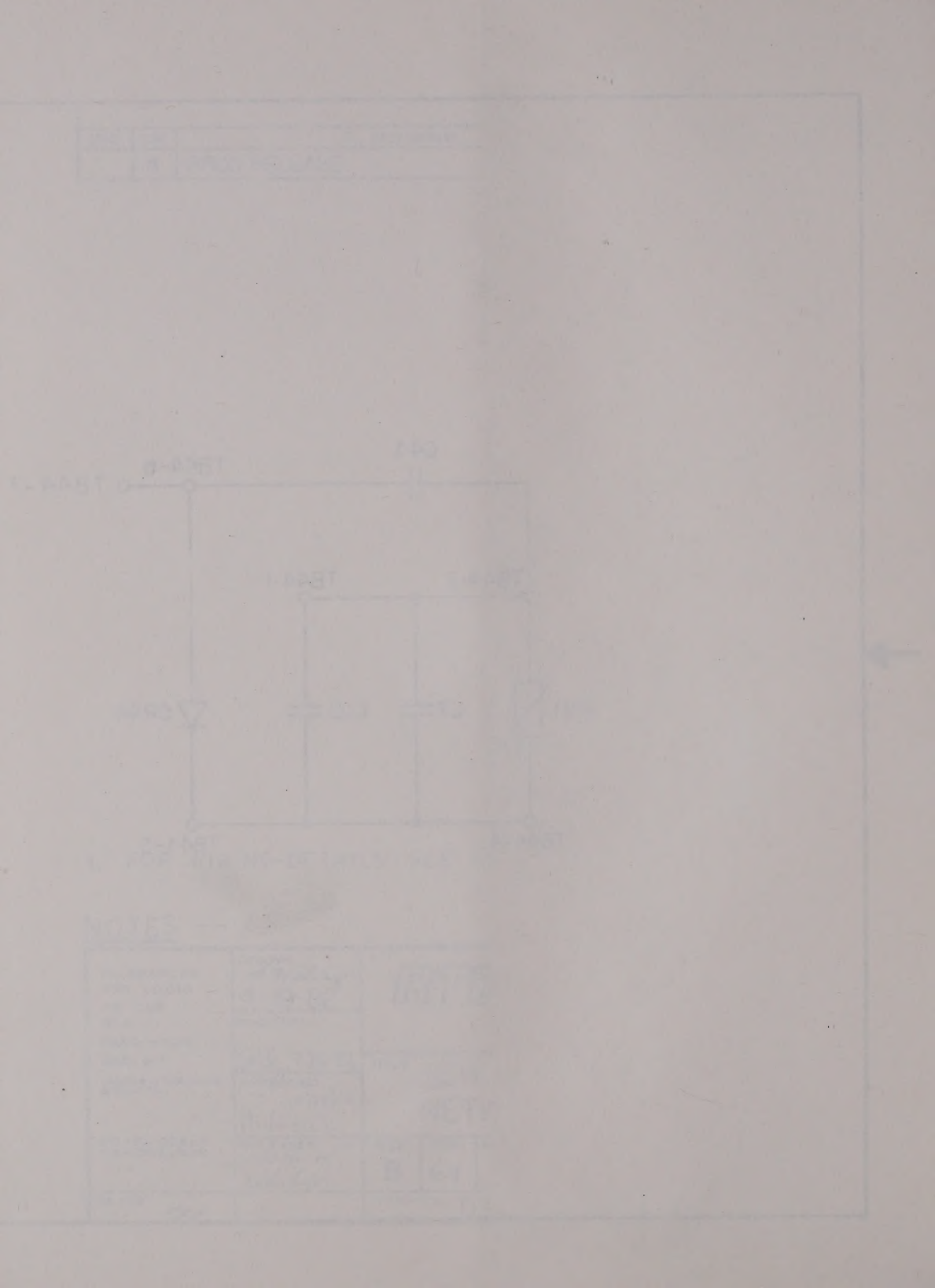
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PROD RELEASE	4/30/82	

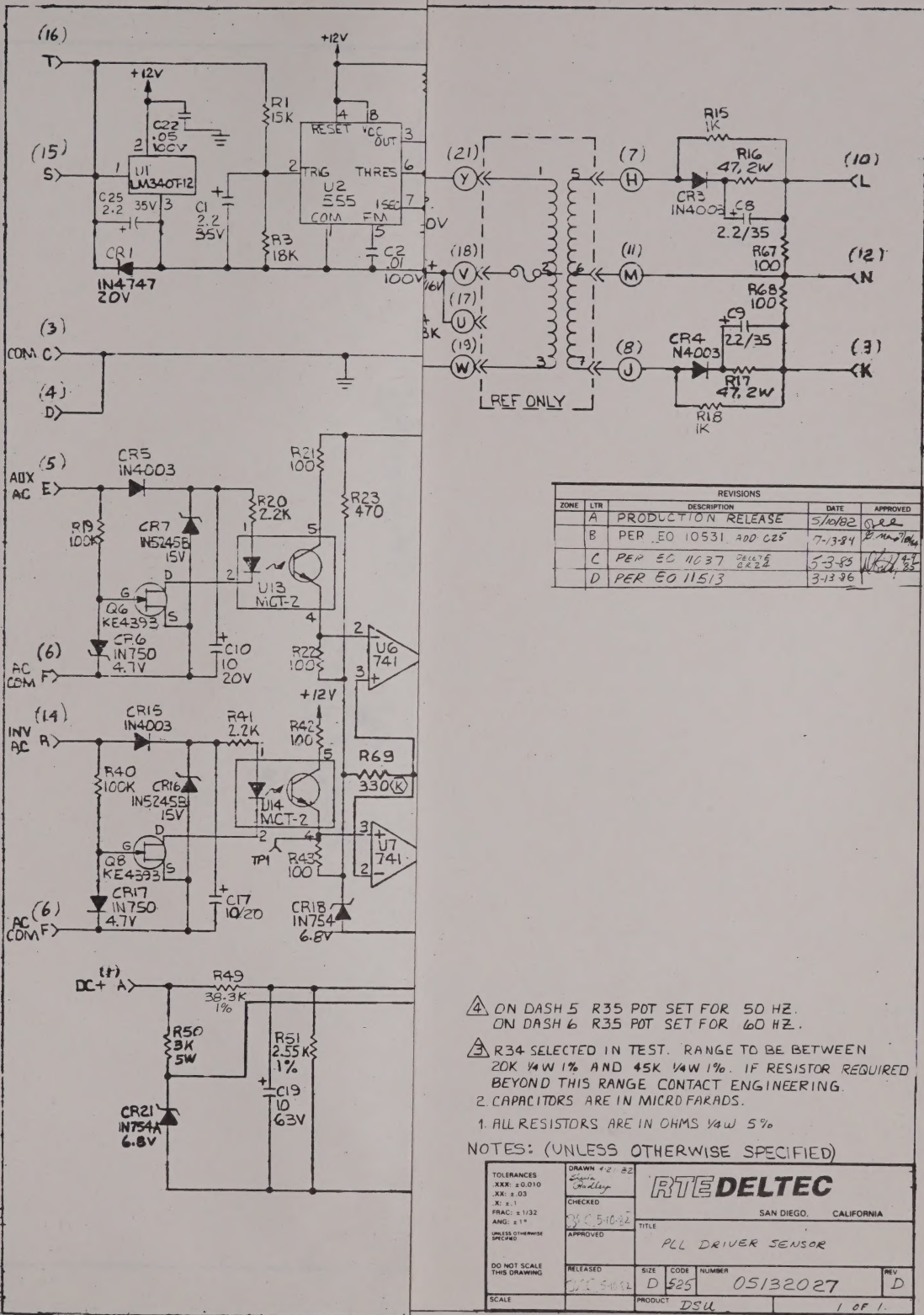
05132014

1. FOR WIRING DETAILS SEE SYSTEM W/L.

NOTES —

TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN A. Walsh 4-19-82	RTE DELTEC SAN DIEGO, CALIFORNIA			
	CHECKED 4-26-82	TITLE SCH BRIDGE PROT STAT NETWORK			
	APPROVED 4/29/82				
DO NOT SCALE THIS DRAWING	RELEASED Monica Mulson	SIZE B	CODE 64	NUMBER 05132014	REV A
SCALE X		PRODUCT DSU		NEXT ASSY	





REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PRODUCTION RELEASE	5/10/82	
	B	PER EO 10531 ADD C25	7-13-84	
	C	PER EO 11037 DELETE CR22	5-3-85	4-7-85
	D	PER EO 11513	3-13-86	

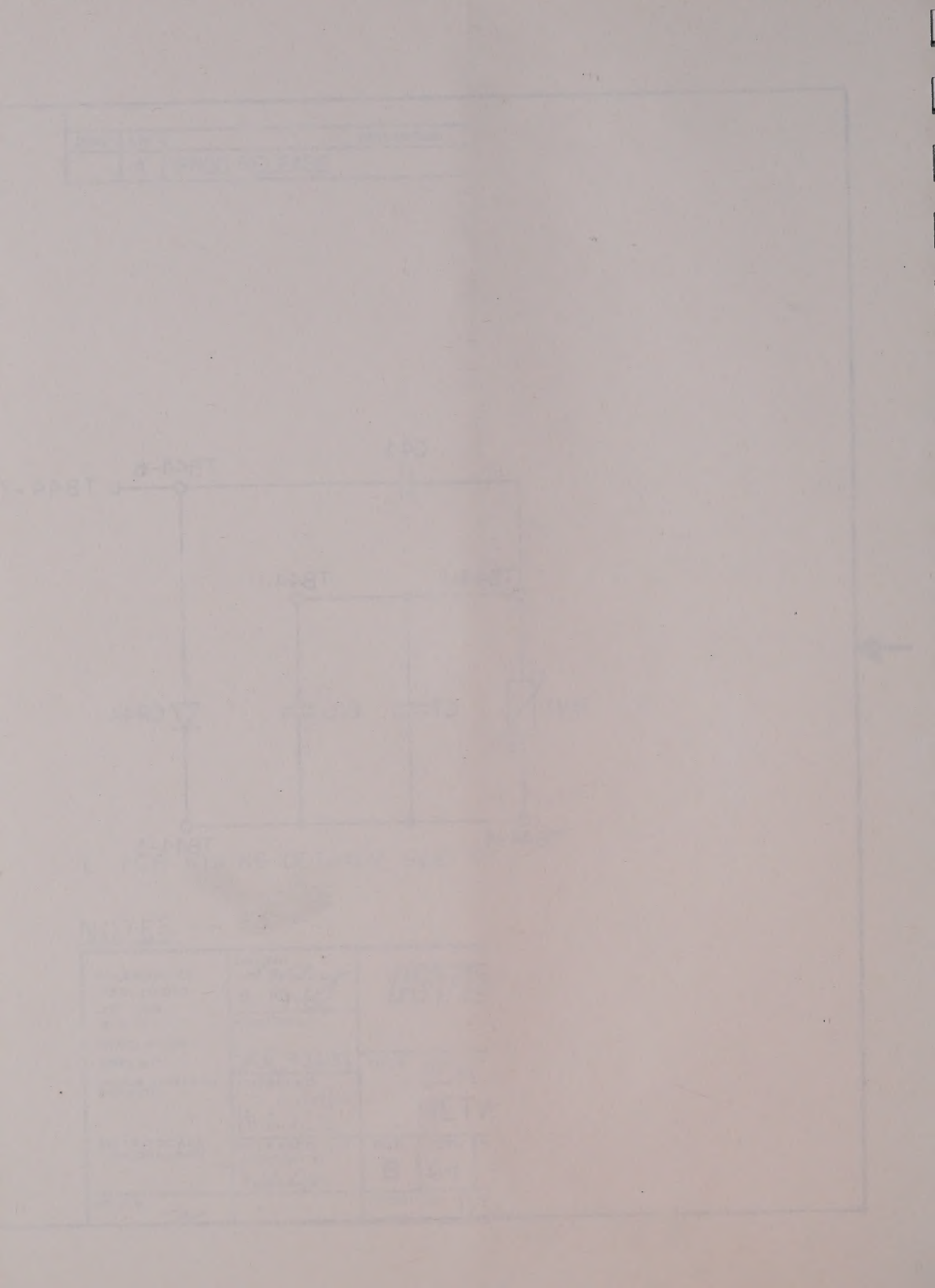
4. ON DASH 5 R35 POT SET FOR 50 HZ.
ON DASH 6 R35 POT SET FOR 60 HZ.

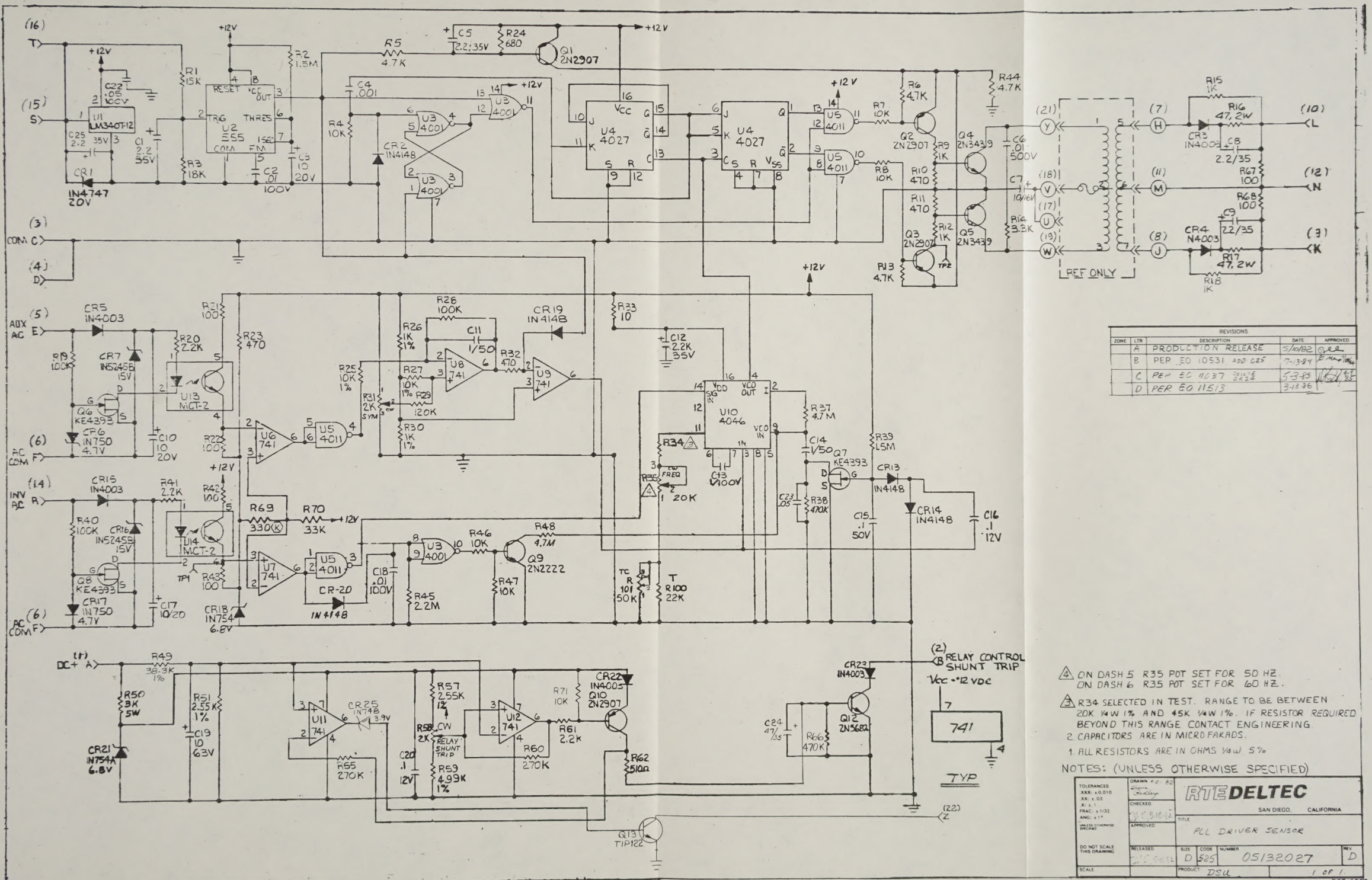
3. R34 SELECTED IN TEST. RANGE TO BE BETWEEN 20K ¼W 1% AND 45K ¼W 1%. IF RESISTOR REQUIRED BEYOND THIS RANGE CONTACT ENGINEERING.
2. CAPACITORS ARE IN MICRO FARADS.
1. ALL RESISTORS ARE IN OHMS ¼W 5%

NOTES: (UNLESS OTHERWISE SPECIFIED)

TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN 4-21-82 Sylvia Hadley	RTE DELTEC SAN DIEGO, CALIFORNIA	
DO NOT SCALE THIS DRAWING	CHECKED DSC 5-10-82	TITLE PLL DRIVER SENSOR	
	APPROVED		
	RELEASED	SIZE D CODE 525 NUMBER 05132027 REV D	
SCALE		PRODUCT DSU	1 OF 1

DSF-1200





REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PRODUCTION RELEASE	5/10/82	
	B	PER EO 10531 ADD C25	7-13-84	
	C	PER EO 11037	5-3-85	
	D	PER EO 11513	3-13-86	

4. ON DASH 5 R35 POT SET FOR 50 HZ.
ON DASH 6 R35 POT SET FOR 60 HZ.

3. R34 SELECTED IN TEST. RANGE TO BE BETWEEN 20K ¼W 1% AND 45K ¼W 1%. IF RESISTOR REQUIRED BEYOND THIS RANGE CONTACT ENGINEERING.

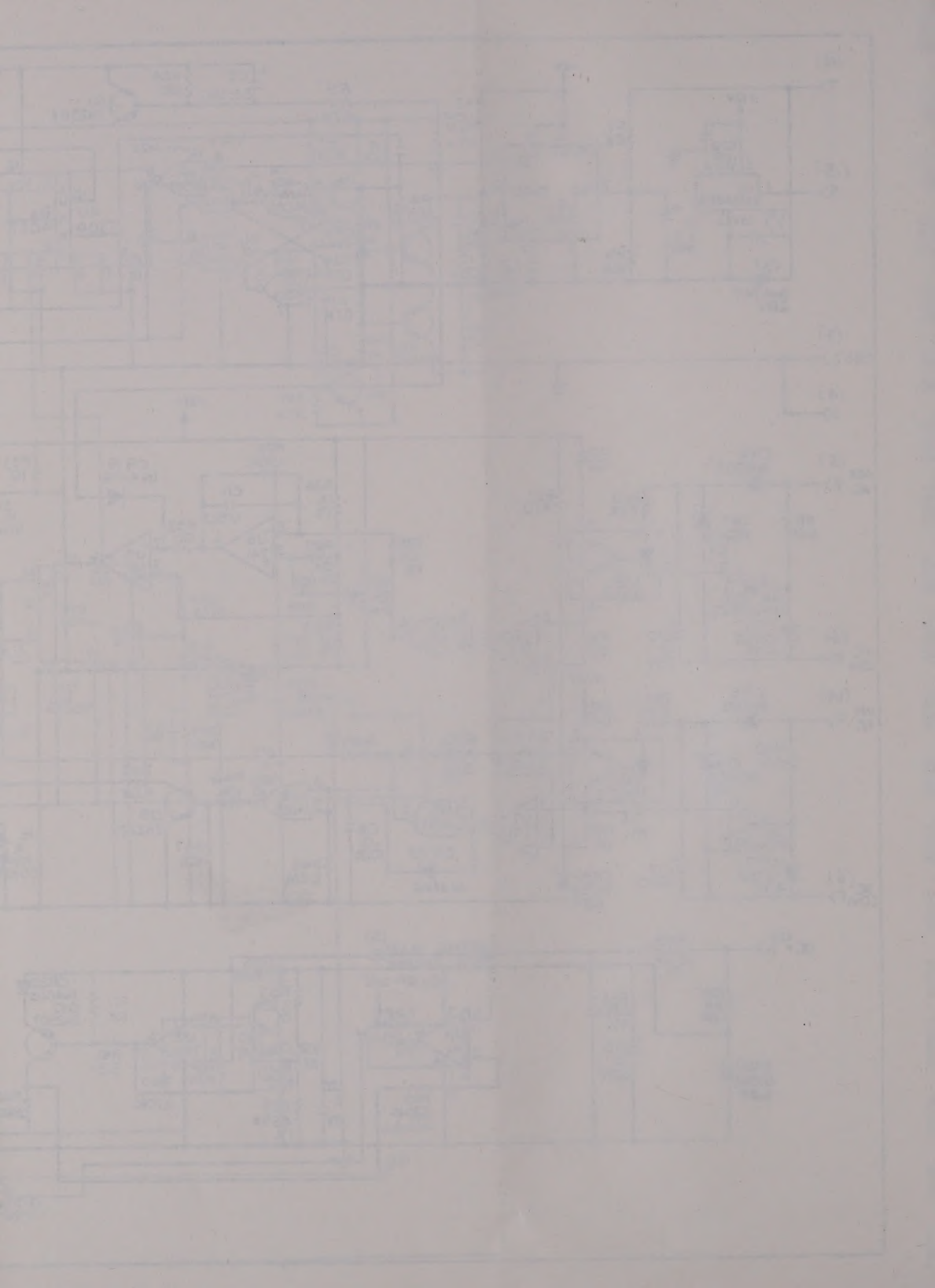
2. CAPACITORS ARE IN MICRO FARADS.

1. ALL RESISTORS ARE IN OHMS ¼W 5%

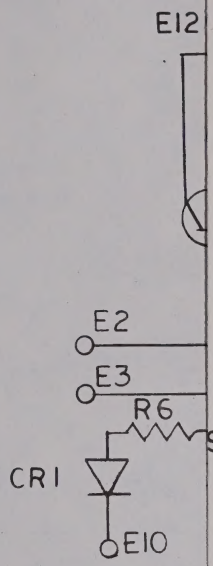
NOTES: (UNLESS OTHERWISE SPECIFIED)

TOLERANCES XXX: ±0.010 XX: ±.03 X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN		RTE DELTEC SAN DIEGO, CALIFORNIA
	CHECKED		TITLE: PLL DRIVER SENSOR
	APPROVED		
DO NOT SCALE THIS DRAWING	RELEASED	SIZE: D	CODE: 525
		NUMBER: 05132027	REV: D
SCALE		PRODUCT: DSU	1 OF 1

DSF-1200



REVISIONS		
	DATE	APPROVED
	4/30/82	11/97
	11-7-83	1-11-3
3 AND R9	7-13-84	7/13/84



05132029

SED ON ALL MODELS.

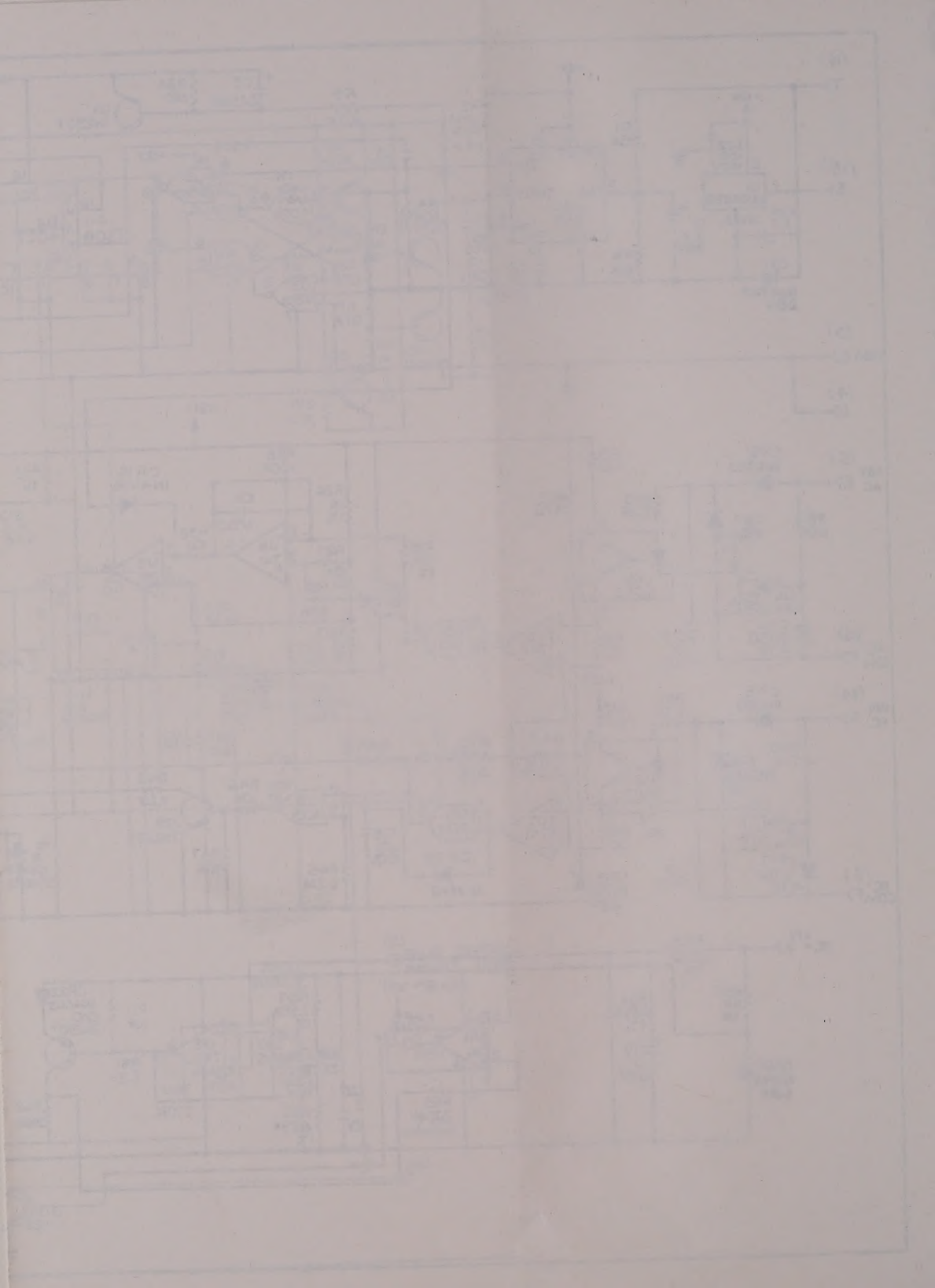
SYSTEM W/L.

DELTEC

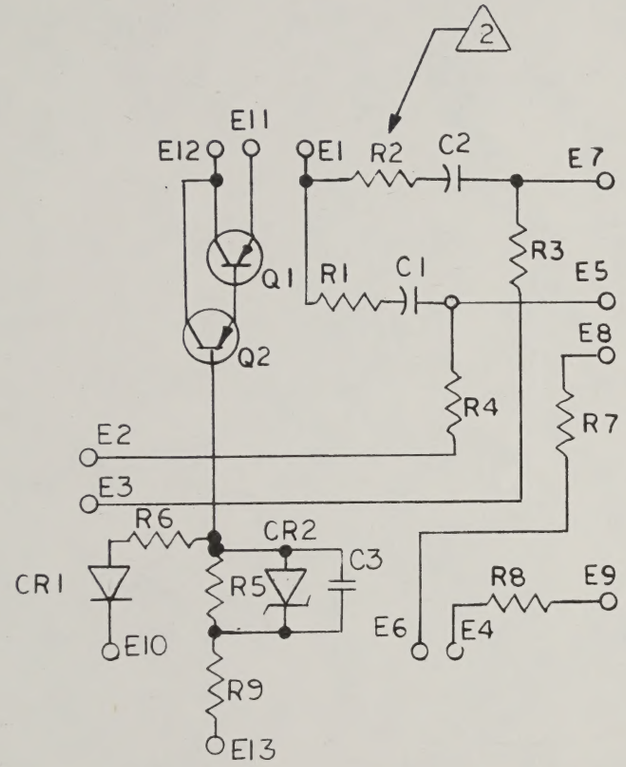
SAN DIEGO, CALIFORNIA

SNUBBER/FILTER DSU

NUMBER	REV
05132029	C
1000-1800	NEXT ASSY



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PROD. RELEASE	4/30/82	11/97
	B	EO 9860 (ADDED CR2)	11-7-83	1-11-3
	C	PER EO 10531 ADD C3 AND R9	7-13-84	7/13/84



[05132029]

2 R1, C1 AND R2, C2 NOT USED ON ALL MODELS.

1. FOR WIRING DETAILS SEE SYSTEM W/L.

NOTES —

TOLERANCES .XXX: ±0.010 .XX: ±.03 .X: ±.1 FRAC: ±1/32 ANG: ±1° UNLESS OTHERWISE SPECIFIED	DRAWN 4-20-82 Sandy Hill APN	RTE DELTEC SAN DIEGO, CALIFORNIA				
	CHECKED 4/29/82					
	APPROVED	TITLE SCH. SNUBBER/FILTER DSU				
DO NOT SCALE THIS DRAWING	RELEASED Monica Chilcott	SIZE B	CODE 64	NUMBER 05132029	REV C	
SCALE NONE		PRODUCT DSU 1000-1800		NEXT ASSY		